Cost Guidelines

UNDERGROUND STORAGE TANK CLEANUP FUND

STATE WATER RESOURCES CONTROL BOARD
UNDERGROUND STORAGE TANK CLEANUP FUND
P.O. BOX 944212
SACRAMENTO, CA 94244-2120
(916) 227-4307
http://www.swrcb.ca.gov/~cwphome/fundhome.htm

ver: 1.0 07/01/96

ACKNOWLEDGMENTS

This guideline is the product of the Division of Clean Water Programs, Underground Storage Tank Cleanup Fund, Technical Unit.

Project lead engineer and principal author:

- Patrick Wheeler

Under the direction of:

- James Munch
- Allan Patton

With assistance and support from the Technical Unit staff:

- Chuck Arnold
- Nancy Callsen
- James DiGiorgio
- Diane Edwards
- Scott Fitzgerald
- Lynne Garrett
- Ismael Jacobo
- Brian Kelley
- George Lockwood
- Steve Marquez
- Linda Sanborn
- Chris Smith
- Christopher Stevens
- Jennifer White

State of California
Pete Wilson Governor

California Environmental Protection Agency
James M. Strock, Secretary

State Water Resources Control Board
P.O. Box 944212
Sacramento, CA 94244-2120
(916) 227-4400

John Caffrey, Chairman
James M. Stubchaer, Vice Chairman
Marc Del Piero, Member
Mary Jane Forster, Member
John W. Brown, Member

Walt Pettit, Executive Director
Dale Claypool, Chief Deputy Director

Table of Contents

Introduction

These guidelines have been developed pursuant to Section 25299.57 (h) of the California Health and Safety Code, which states, in part, that "The State Water Resources Control Board shall develop a summary of expected costs for common remedial actions. This summary of expected costs may be used by claimants as a guide in the selection and supervision of consultants or contractors."

This document is a product of the State Water Resources Control Board Underground Storage Tank Cleanup Fund Program (Fund). The primary purpose of this document is to provide guidance[1] to claimants for evaluating proposed and incurred corrective action costs at sites eligible for participation in the Fund. Specifically, these guidelines will help claimants identify reimbursable goods and services and understand how the Fund evaluates activities and costs. Claimants will also be able to judge whether additional justification will likely be required to support a given cost, or whether a call for assistance from the Cleanup Fund is in order.

*This is a guideline only, it does **not** establish reimbursement limits for the listed items and activities. It is not intended to remove the element of competition or freedom of choice from the industry. The intention of these guidelines is **not** to replace the three bid requirement (see Policy Section, page 12).*

Standard supporting documents, as described in the *Reimbursement Request Instructions* (not included in this document), are required for all costs submitted for reimbursement.

A secondary purpose of these guidelines is included in section 25299.57 of the California Health and Safety Code which states that for professional engineering and geologic work claimant's shall submit multiple proposals and fee estimates and the "claimant's selection of the provider of these services is not required to be based on the lowest estimated fee, if the fee estimate conforms with the range of acceptable costs established by the board." Multiple proposals and fee estimates are inclusive of this document's unit and project costs.

Consultants and contractors contract directly with the claimant, not the Fund. The choice in selecting a consultant or contractor is the responsibility of the claimant, as is the ultimate responsibility for paying for costs incurred. *Just because the cost is within the guidelines, does not mean that the work was necessary or contributed to the advancement of the cleanup of a particular site or that it is eligible* (see Work Approval and Direction, Policy Section, page 4).

---

[1] **Notice:** *This document is intended solely as general guidance and information. It is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the State of California.*

All costs submitted for reimbursement will be evaluated based upon the information available at the time of review. For professional engineering and geologic work where the low estimate is not selected, the Fund strongly recommends that claimants request pre-approval of the costs (see Cost Pre-Approval, Policy Section, page 15).

Professional engineering work must be conducted under the responsible charge of a registered Civil Engineer or Geotechnical Engineer. This does not mean that the registered professional must be involved in all activities; it does not mean that the professional must do all the work, it means that the registered professional is in **responsible charge** of the activities and ensures that the activities are conducted in a thorough and professional manner.

Some firms do not have registered professionals on staff. This may be a violation of the Geologist and Geophysicist Act (See Personnel Qualifications and Work Descriptions, Policies Section, page 1). **Work that is conducted in violation of the laws of the State of California may not be eligible for reimbursement.** Work, conducted without properly qualified professionals overseeing the activities, has encountered difficulties that resulted in reduced reimbursements. It is the responsibility of the claimant to comply with all State and Federal Laws when hiring professional services.

Any mention of brand names or specific technologies is not an endorsement of that brand or technology by the State of California, the Fund, or any of the staff. The mention of brands and names is purely for illustrative purposes.

How to use this guide:

The Cost Guidelines consist of three main sections; 1) Unit Costs, 2) Project Costs, and 3) Policies. These are described below. The appendix contains a few example projects and a list of common acronyms and abbreviations. It also contains common terms that are used in this document and that may be encountered during the investigation and remediation of a contaminated site.

1) Unit costs: A unit of service, activity, or product is delivered for a set cost. Examples include an analytical test from a laboratory or an hourly rate for a consultant's staff person. Where applicable, these costs must be accompanied by an invoice from a subcontractor (analytical, drilling, rental shop, etc.).

Costs are listed for common goods and services used in corrective actions. Listed costs do not include any markups which may be added by a primary (prime) contractor. Use these costs as a comparative guide when evaluating costs presented in bids or estimates received from consultants or contractors.

Exercise caution when applying unit costs. Just because a unit cost is listed does not mean it is reasonable to extend that cost over the entire range of

activities. Such things as "economy-of-scale" must be considered. If extensive work is required, a lower rate can often be negotiated.

2) Project costs: A project cost is typically an aggregate of unit costs such as: consultant billing hours, equipment rental, and subcontractors, or it may be simply consultant labor. Listed project costs generally describe a level of effort required to perform certain tasks. More than one project cost may need to be referenced to account for all work in a given bid. For example, a single bid for a "Groundwater Monitoring" may include a Groundwater Monitoring Event (see Project Costs, page 11), Free Product Removal (see Project Costs, page 13), and Report Preparation (see Project Costs, page 14). Tasks and conditions will differ from site to site and the Fund staff will review each case individually.

3) Policies: A description of various Fund policies, standard practices, and statements on how the Fund addresses issues concerning reimbursement. General information intended to be helpful, but not necessarily directly tied to certain costs, is included in this section.

The "Exclamation" icon is used to designate costs or activities that are especially variable, misunderstood or prone to excess. Prior to incurring costs associated with these activities, the Fund **requires** that they be pre-approved.

Watch out for: When appropriate, a "watch out for" section is included. This section describes some common pitfalls associated with the type of costs in question. If you do not "watch out" for the pitfalls, and just go by the numbers listed in this guideline, you may not achieve a reasonable cost. These comments are based upon Fund experience with other claimants, and problems they have had, and is intended to assist all claimants.

Variations by region:

It has been the Fund's experience that the costs vary **more** from firm to firm than by any specific region. Costs in many remote areas far exceed those in so-called 'expensive areas.' Specific areas have regional variations, regulatory variations, and resource variations that have more impact on local costs than the generic cost of living for that particular region. It is because of this variation that each area in the state has been assigned to a specific reviewer at the Fund. This allows us to become familiar with specific regional variations and account for them. To account for all regional variations would be beyond the scope and intent of this document.

Effective date of this guide:.

As a cost **guideline,** the cost guidelines do not have an effective date. The document is intended to assist claimants. It is not a regulatory document, it is a guideline only, it does not establish reimbursement limits for the listed items and activities. It is not intended to remove the element of competition or freedom of choice from the industry. The intention of these guidelines is not to

replace the three bid requirement. There is no effective date. The guidelines will not be applied, retroactively or otherwise.

Revision of this guide:

The Fund has made a concerted effort to prepare a document that will meet the needs of all of our claimants. We will be making a continuous effort to keep the guideline current and responsive to changes in the industry and regulatory aspects, as well as cost changes in California. As specific issues or changes come up, periodic additions or supplements may be prepared and incorporated. Major revisions will not occur more often than every two years.

Contact the Fund:

The Fund's policy is to be very responsive to requests for assistance from claimants. If you have any questions, need additional assistance, are unsure of an items reimbursement status, need some assistance finding consultants, getting bids, understanding local directives, or what your status is, please contact the Fund. We will try to assist you; if we cannot help, we will try to direct you to someone who can. For assistance call your specific contact person at the Fund or telephone **1-800-813-3863**. Use the table below to keep the name and telephone numbers of your specific contact people with the Fund available.

Section	Tasks	Name Phone Number
Claims Review	Application through letter of commitment: eligibility, permits, eligibility of tank, priority class designation, unauthorized release information.	**(916) 227-**_____
Payments	Reimbursement request submittals: verification of payment, cost incurred by claimant, submitting for reimbursement.	**(916) 227-**_____
Technical Review	Assistance throughout entire process, specifically: three bids, reasonable costs, assistance selecting consultants, pre-approval of costs, review or payment requests, authorizing reimbursement.	**(916) 227-**_____
Settlements	Review of settlement issues: moneys from insurance, lawsuits, written agreements, third party costs, application of proper offsets to reimbursement requests.	**(916) 227-**_____
Fax	All	**(916) 227- 4530**

For the most complete and up-to-date information on the Fund, and copies of all public documents (including this one), visit our World Wide Web site at:
http://www.swrcb.ca.gov/~cwphome/fundhome.htm

Unit Costs

Personnel Labor Rates

Shown below are labor rates for consultant personnel. Individual companies may use different titles and descriptions for employees. The Personnel Qualifications and Task Descriptions (Policies, page 1) show typical definitions and tasks for these personnel.

There are two major contributors to excessive personnel costs. One is the use of high billing rate personnel (e.g., Senior Engineer/Geologist) to perform tasks which require a lower level of expertise. It is very important to use only the appropriate staff level for the tasks performed. Some consultants, either through staffing difficulties, scheduling problems, or a lack of staff may use a higher billed staff to perform tasks commonly performed by a lower billed staff person. This is acceptable, if the billing rate is adjusted downward to correspond to the task performed. The other contributor to excessive costs is the level of effort required to perform common tasks. The level of effort for common tasks is described in the Project Costs section.

Reimbursement will be limited to the actual value and level of the work performed, irrespective of the title of the employee. Fund staff will make the final determination of eligibility for all costs submitted for reimbursement.

These billable rates include: labor, benefits, taxes, overhead, profit, and ancillary charges such as copies, faxes, telephones, postage, paper clips, binders, cellular phone charges, computer charges (CADD, word-processing, mapping), etc.

Personnel Labor Rates

Professional Staff Title/Classification	Billable Rate ($/hr)
Principal Engineer/Geologist	105
Senior Engineer/Geologist	90
Associate Engineer/Geologist	80
Project Manager	75
Staff Engineer/Geologist	65
Technician	50
Drafts Person	45
Clerical	35

Watch out for: excessive level of effort and proper level of professional staff for tasks.

Analytical

The following is a list of common analytical tests performed on soil, water and air samples to test for the presence and concentration of contaminants. In most cases the analytical tests will be performed by a subcontractor. **The direct invoice from the California Certified laboratory detailing what samples were run, the date run, and actual cost is required with payment requests.** The costs below are inclusive of all supplies, sample handling, and disposal fees.

Lab Analysis (Soil & Water)

Suspect Substance	EPA Method[1]	Component	Cost
Gasoline/Diesel	8015, DHS	Total Petroleum Hydrocarbons (TPH)	55
	8020	BTEX/MTBE	55
	8015/8020	TPH/BTEX/MTBE (gasoline only)	55
	8240	BTEX/Volatile Organic Compounds[2]	150
	6010, 7421	Total Lead[3]	40
	LUFT, DHS	Organic Lead[3]	40
Waste Oil	418.1	Total Recoverable Petroleum Hydrocarbons (TRPH)	40
	8020	BTEX/MTBE	55
	8240	BTEX Chlorinated Hydrocarbons [2]	150
	CAM 17	Title 22 Metals California Method[4]	150
Stoddard Solvents	8015	Total Petroleum Hydrocarbons (TPH)	55

[1] These EPA Methods are common terminology in practice used by the industry today. Some substitutions, modifications, and alternatives to the precise EPA Method are common. Verify lab certification.

[2] Fuel fingerprint analysis can be run a limited number of times. Justification may be required to explain the need for this expensive and precise test.

[3] Lead analysis may be required when leaded gasoline was stored in the UST. Usually a limited number of these tests are run. If this test is performed regularly, justification will be required.

[4] Metal contamination is not typically an eligible substance, one screening sample is normally allowed if specifically required, or as needed for landfill disposal. Justification for additional sampling will be required.

Methyl Tertiary Butyl Ether (MTBE) is a gasoline additive of increasing concern in California. Many local regulatory officials are requesting MTBE analysis as a part of site assessment. MTBE can be easily and inexpensively quantified using the existing EPA 8020 test by simply reporting the information that is already available from the gas chromatograph resulting from the analysis. Most laboratories do not charge extra for MTBE analysis.

Standard turn around time (TAT) is normally between 5 and 14 days depending upon the laboratory and their current workload. Rush charges may be incurred when analytical results are requested within 24 hours. Rush charges usually amount to a 50% to 100% surcharge upon the standard price. Rush charges must be justified to show that they are necessary, result in a net cost saving, and must be kept to a minimum.

Various landfills and regulatory agencies may require tests, such as: PCB's, ignitibility, corrosivity, reactivity, bioassay, and others. These tests will be considered when soils from an eligible source are destined for disposal at a permitted facility. Any additional costs incurred due to the presence of ineligible substances detected as a result of these tests are not eligible for reimbursement. Reimbursement for unusual tests, as may be required by a landfill, will be evaluated based upon the contaminating substance, requirements of the landfill, and requirements of the local regulating agency. Copies of landfill requirements are to be included with the reimbursement request.

Use of on-site labs is increasingly common. The use of an on-site lab can save sample transportation and rush charges and give immediate results, reducing the time expensive equipment must be kept in the field. On-site labs are primarily used for excavations, step out borings, and accelerated site assessments. To decide if an on-site lab should be used, the following considerations should be addressed: 1) Will it provide a lower overall cost?, 2) Will enough samples be analyzed to warrant it?, 3) Will it provide necessary information to prevent unnecessary costs?

Individual laboratories bill their on-site laboratories differently. Many have a flat fee while others use a flat rental rate and a per sample charge. Whichever method is used, the total cost should be approximately the same. The following are common rates for an on-site laboratory:

On-Site Laboratories		
Flat Fee		**Cost**
Daily Rental Fee	normally covers 15-30 samples per day	1,100
Variable Fee		
Mobilization/Daily Fee	Includes daily mobilization, chemist, and all equipment supplies and disposal.	300
Analysis Charges	charge for each analysis performed during the day	50

Under some conditions sampling of air for contaminant constituents may be required. A copy of the Air Pollution Control District (APCD) permit, or a description of the analytical requirements from other authorizing agency, will be required before reimbursement can be made for air samples.

Lab Analysis (Air)		
Suspect Substance	**Component**	**Cost**
Gasoline	TPH or TPH/BTEX, Volatile Aromatics	100

Watch out for: Laboratories not certified by the California Department of Health Services Environmental Lab Accreditation Program, unnecessary analysis, rush costs, high markups, lack of laboratory invoices, unnecessarily expensive tests when they are not needed. The lab accreditation program can be contacted at: 2151 Berkeley Way, Annex 2, Berkeley, CA 94704-1011, (510) 540-2800.

Supplies (Field, Wells, Report, Miscellaneous)

The following are typical rates for supplies used in the performance of corrective action work. These costs are for generic equipment and supplies.

Supplies (Field, Well Construction, Miscellaneous)		Size	Price
Field Supplies			
	Soil Sampling Liners (Brass)	2" X 6"	6.00
	Bailers (Disposable) Polypropylene	1.5" O.D.	6.00
	Rope (Disposable) For Disposable Bailers		Small Item
	Tedlar Bags (1 Liter)	Each	7.75
	Film	Roll	At Cost
	Film Developing	Roll	At Cost
	Gloves: Disposable Nitrile	Pair	Small Item
	Gloves: Disposable Vinyl, Latex	Pair	Small Item
	Decontamination Supplies		Small Item
	Distilled Water		Small Item
Well Supplies			
2" PVC, Schedule 40			
	PVC Well Casing (10' Lengths)	Per Foot	1.75
	PVC Well Screen 0.010" & 0.020" (Up To 5' Lengths)	Per Foot	3.75
	PVC Well Screen 0.010" & 0.020" (Up To 10' Lengths)	Per Foot	3.00
	Threaded Cap (Top Or Bottom)	Each	5.50
	Slip Cap	Each	1.00
	Locking Cap	Each	20.00
4" PVC, Schedule 40			
	PVC Well Casing (Up To 10' Lengths)	Per Foot	3.75
	PVC Well Screen 0.010" & 0.020" (Up To 5' Lengths)	Per Foot	7.50
	PVC Well Screen 0.010" & 0.020" (Up To 10' Lengths)	Per Foot	6.00
	Threaded Cap (Top Or Bottom)	Each	9.00
	Slip Cap	Each	4.50
	Locking Cap	Each	22.00
Concrete			
	Ready Mix	90 Pound Bags	3.50
	Portland Cement Concrete	90 Pound Bags	7.50
	Sand Cement Slurry Backfill w/ Delivery	Cubic Yard	40.00
Well Covers			
	Manholes(Locking/Tight/Traffic Rated)	9 Inch	50.00
	Manholes(Locking/Tight/Traffic Rated)	12 Inch	57.50
	Standpipe, steel, locking	8" dia. x 3'	65.00
	Standpipe, steel, locking	8" dia. x 5'	65.00
	Christy Box	8"	50.00
	Christy Box	12"	70.00
Grout			
	Bentonite Grout	50 Pound Bag	22.75
	Bentonite Chips	50 Pound Bag	7.75
	Bentonite Granular	50 Pound Bag	6.25
	Bentonite Tablets	50 Pound Bag	30.50

Supplies (Field, Well Construction, Miscellaneous)		Size	Price
Sand (100 Pound Bags)			
	Monterey Sand	100 Pound Bag	5.00
	Silica Sand	100 Pound Bag	3.50
Miscellaneous			
	Padlocks		At Cost
	Asphalt Patch (Cold-Mix)	50 Pound Bag	6.50
	55 Gallon Drum		35.00
	55 Gallon Drum Liner (makes drums re-usable)		0.50
	Visqueen 6 mil, 20'x100'	1 roll	61.50
	Tyvek Suits	each	6.00
Report Supplies			
	Report Reproduction (Duplication Cost)	(Example, 300 Pages)	15.00
	Report Binding	Report Copy	3.00

There are quite a few small items that may be used during site investigation and cleanup. It is very difficult to account for some of these minor items that range in cost from $0.05 to $5.00 each. The following is a common cost to account for various small consumable items used during extensive field activities.

Small Items	Price
For example: gloves, water, ropes, tape, soap, twine, pens, bottles, paint, warning tape, . . .	20.00

Costs of replacement Granular Activated Carbon (GAC) can be found in the Operation & Maintenance, Project Costs on page 28.

Protective equipment may be required to adequately protect the health and safety of the workers attempting to remediate the site. Level D is adequate for almost all activities at petroleum UST sites in California. Levels A, B, and C are almost never used at petroleum UST sites in California. The Fund does not reimburse for itemized Level D equipment. This normally includes coveralls, safety boots, safety glasses, and hard-hats. These are basic equipment and do not warrant a separate charge.

Equipment (Small)

The costs below are for equipment in good mechanical condition, complete as required. This also includes maintenance, batteries, fuel, cleaning, repairs, insurance, shelter, security, depreciation, purchase price, overhead, and general and administrative costs. Unless otherwise noted, costs do **not** include the labor, overhead, and profit, for the operator.

The Fund will only reimburse for the most cost effective method of obtaining the equipment (see Rental/Purchase of Equipment, Policies, page 7). The claimant is ultimately responsible for determining which method is most cost effective for their site. Equipment purchase will be reimbursed over the length of time needed on the project. Contact Fund staff for any questions regarding rental or purchase.

Equipment (Small)		Daily	Weekly	Monthly	Purchase
Bailers					
	Bailer (Disposable)	See Supplies Section			
	Bailer (P V C)	5			20
Carbon Adsorbers: includes initial carbon supply, all internal piping, and coated steel canister					
	Liquid Phase: 250 lbs	5	18	66	
	Liquid Phase: 500 lbs	20	77	275	
	Liquid Phase: 1,000 lbs	24	97	345	
	Liquid Phase: 2,000 lbs	38	150	535	
	Vapor Phase: 250 lbs	6	22	77	
	Vapor Phase: 500 lbs	13	51	183	
	Vapor Phase: 1,000 lbs	23	91	325	
	Vapor Phase: 2,000 lbs	80	316	1,130	
Compressors					
	Air Compressor w/ paving breaker	80	280		
Concrete Coring/Cutting Equipment					
	8" Diameter (including bit)	55			
	Concrete Saw	20	75		
Data Collectors					
	Datalogger (2 channel with pressure transducer)	65	325	510	
	Datalogger (8 channel)	115	575	780	
	Pressure Transducer	35	175	225	
	Photo-ionization Detector (P I D)	90	148		5,000
	Flame-ionization Detector (F I D)	90	168		5,500
	Water level indicator	15	28		400
	Interface Meter	25	75		595
	pH, Conductivity, Temperature	20	60		300
	Dissolved Oxygen Meter	20	60		650
	Turbidity	15	60		625
Decontamination					

Equipment (Small)		Daily	Weekly	Monthly	Purchase
	Decontamination Supplies				See Supplies Section
	Pressure washer (cold water) 4 gpm	45	180		
	Pressure washer (hot water) 4 gpm	55	220		
Fences					
	Chain Link $/ft			3.55	9
	Temporary Construction/Barrier $/100 ft		1	8	100
Field Equipment					
	Hand Auger	15	60		540
	Core Sampler & Hammer	3.25	13		460
Generators, gasoline powered					
	Generator 400 Watt	20	68		
	Generator 3,500 Watt	30	104		
Miscellaneous					
	Soil Sampling Liners				See Supplies
	Welding/cutting equipment	8	32		
Pumps					
	Gasoline Powered Pump, 2" dia., 150 gpm	50	200		
	Pump Submersible, 2", 10 gpm	45	180		
	Pump Submersible 4", 20 gpm	50	200		
	DC Purging Pump 2", 2.8 gpm (for up to 40 ft wells)	5	20		100
	Hand Pump 2", up to 3 gpm (for up to 50 ft wells)	15	60		335
Skimmers/Separators/Hydrocarbon Recovery					
	Passive Skimmer (1 liter)		10	30	350
	Electric Skimmer		75	265	3,700
	Filter Separator, 4", electric, 0.3 gpm		84	300	
	Filter Separator, 6", electric, 0.6 gpm		95	340	
Storage Tanks					
	Storage Tank 1,000 Gallons	11		320	
	Storage Tank 5,000 Gallons	14		420	
	Storage Tank 21,000 Gallons	20		600	
	55 gallon barrels/drums		1	4	35
Survey Equipment					
	Level, tripod, rod/prism, tape/chain	15	60	212	
	Transit, tripod, rod/prism, tape/chain	30	120	425	
Traffic Control Components (Also See Project Costs, Miscellaneous)					
	Barricades	1	4	14	85
	Cones/Delineators (25 each)	5	20	50	115
	Signs	0.75	3	11	35

There are many small items that should not be charged at individual rates. These items are considered part of necessary equipment to do the jobs performed. These costs are often called ancillary charges and are considered to be included in the billing rate of the staff or Small Items (see previous section). These costs include, but are not limited to:

telephones	copies	cellular phones	field phones
faxes	postage	portable computers	tool kits
computers	paper clips	cameras	drum dolly
CADD computers	office electrical	fire extinguishers	dolly

word-processing binders first aid kits flares

Watch out for: Rental rates exceeding purchase price, charges for equipment that was not needed or used, daily charges that exceed a weekly or monthly amount within a week or a month, charges for equipment down time, purchase of small equipment and supplies (e.g. batteries) or repairs to equipment.

Equipment (Heavy)

The costs below are for equipment in good mechanical condition, complete as required with attachments, tools, hoses, oilers, cables, bits, blades, buckets, skips, hooks, fuel, tires, lubricants, etc. This also includes maintenance, cleaning, repairs, OSHA equipment, insurance, shelter, security, depreciation, and overhead, general and administrative costs. **Equipment rates include all costs for equipment, operation, and operator.** Detailed subcontractor invoices for large pieces of equipment are standard supporting documentation that is required before reimbursement can be made.

Equipment Operation (Heavy)		Hourly	Daily	Weekly
Backhoes (operated)				
	Backhoe - Light Duty (12'-18' depth)	65	520	2,400
	Backhoe - Medium Duty (15'-20' depth)	95	760	3,360
Compactors (operated)				
	Compaction - Wacker	45	360	1,760
	Compaction - Walk Behind	53	424	2,016
	Compaction - Riding	55	440	2,080
Excavators (operated)				
	Excavators- Light Duty (20'-22' depth)	85	680	3,040
	Excavators- Medium Duty (24'-26' depth)	110	880	3,840
	Excavators- Heavy Duty (over 26' depth)	160	1,280	5,440
Loaders (operated)				
	Bob cat	60	480	2,240
	Loader - Light Duty (up to 100 hp)	67	536	2,464
	Loader - Medium Duty (up to 200 hp)	87	696	3,104
Trucks				
	Truck/Automobile			0.35 $/mile
	Specialized Equipment Truck - 1/2 ton			0.40 $/mile
	Truck - 10 cubic yard Dump (operated)	50	Bill time actually used.	
	Truck - 14 cubic yard Dump (operated)	55		
	Truck - Dump w/ trailer (20 cubic yard) (operated)	60		
	Truck - Belly Dump (20 cubic yard) (operated)	60		
	Vacuum Truck (operated)	60		

Watch out for: rental for equipment that was not needed or used, excessive mobilization and demobilization charges, unnecessarily large equipment for tasks.

Note: Damage resulting from the use of improper equipment, or the improper use of equipment, is not eligible for reimbursement.

Drilling (Borings and Wells), Direct Push Technologies

Drilling (Borings and Wells):

The necessary supplies to complete wells are found in Unit Costs, Supplies (Field, Well Construction, Miscellaneous), page 4. The costs based upon a time and materials rate should be commensurate with the per foot rate described below.

Geological and drilling conditions vary greatly throughout the state. Extra costs, due to difficult drilling conditions and/or limited site access, will be considered on a case-by-case basis. These extra costs may include additional time or more expensive drilling methods required due to geological conditions.

The rates below are for drilling equipment used to install monitoring wells and borings. The rates are for equipment in good mechanical condition with all necessary attachments, tools, hoses, oilers, cables, bits, fuel, tires, and lubricants. The rates also include regular maintenance, cleaning, repairs, OSHA equipment, insurance, shelter, security, depreciation, overhead, general and administrative costs and profit. Drilling rig rates normally include at least two operators. Larger, more expensive drill rigs, such as air or mud rotary, may be needed on occasion because of peculiar geologic conditions. Request preapproval for unusual costs prior to incurring them. **Detailed subcontractor invoices for drilling costs are standard supporting documentation needed for reimbursement.**

Equipment (Drilling)	Hourly Rate	Daily Rate
Mobilization	65	
Hollow Stem Auger with 3" to 7" diameter auger	125	
Rotary Drill Rig	140	
Direct Push Technology Rig	125	
Hot Water Pressure Washer		50
Cement Pump		25
Support Truck/Van		50
Compressor with Paving Breaker		50
Concrete Coring Machine		50
Generator (3500 watt)		30

The following costs are based upon a "per foot" cost for installing borings and wells. They are based upon; 40 mile travel each way, mobilization and demobilization of the drilling rig, 2 persons, service truck, decontamination unit (steam cleaner), drilling and sampling every 5 feet, backfilling borings and well

materials, and they are based on a minimum of drilling 80 ft per day for borings and 60 ft per day for wells. These tables should be used for **general evaluation** of drilling only, actual costs may vary.

Drilling (Soil Borings, Monitoring Wells)		
Description	**Depths**	**$/ft**
Borings: backfill with slurry mixture	to 35 feet	18.00
Borings: backfill with slurry mixture	35 to 80 feet	17.00
Borings: backfill with slurry mixture	80 to 120 feet	16.00
Wells: includes PVC screen and blank schedule 40, end plug, locking cap, sand, bucket of bentonite pellets for seal, concrete grout, and well box; also includes 15 minutes surging time to set sand pack. This rate will be reduced if no sampling is needed during drilling.		
2" PVC	to 30 feet	32.00
2" PVC	31 to 80 feet	30.00
2" PVC	81 to 120 feet	32.00
4" PVC	to 30 feet	35.00
4" PVC	31 to 80 feet	34.00
4" PVC	81 to 120 feet	33.00
Well Demolition: drilling rig costs, includes backfill		
2" PVC	to 120 feet	16.00
4" PVC	to 120 feet	18.00

Additional drilling costs may be incurred if continuous core sampling is required by the local regulator, if angle boring is needed to sample below an obstruction, or if a Cone Penetrometer Test (CPT) is performed. The following costs cover some of the miscellaneous charges that may be incurred. Other costs will be considered on a case by case basis.

Miscellaneous Drilling Costs		
Description	**Size/Unit**	**$/unit**
Additional Surging and Bailing	hourly	110.00
Continuous Core Sampling	additional $/ft	3.00
Angle Drilling	additional $/foot, to 60 feet	2.00

Direct Push Technologies:

The cone penetrometer is capable of rapidly providing valuable subsurface information. In its basic form, truck or van mounted hydraulic rams force a cone shaped point containing instruments that measure tip resistance, sliding friction and inclination. They can be used to take discrete samples of soil or water. The depths that can be reached depend upon subsurface conditions but are often limited to less than 100 feet. Some of the benefits of this technology are that it does not generate drilling waste, it is relatively quick and less labor intensive, and it allows for continuous evaluation of subsurface conditions.

Disadvantages include regulatory agency acceptance, possible subsurface obstructions, and potential of smearing contamination. This technology must often be followed up by traditional monitoring wells and borings.

Cone Penetrometer		
Includes: CPT Equipment, vehicle, labor, professional oversight, all necessary supplies, replacement tips, grout, sample rings and all other necessities to perform field work.	$/ft	15.00

Watch out for: Lack of breakdown of costs, lack of subcontractors (drillers) invoices, double billing for well completion supplies.

Project Costs

Workplans

Section 25299.37(c)(1) of the Health and Safety Code specifies that when a responsible party undertakes corrective action, including preliminary site assessments and investigations, they "shall prepare a workplan that details the actions to be taken by the . . . responsible party to achieve the required corrective action." Section 2722 of Article 11 of the California Code of Regulations specify that "(t)he responsible party shall submit a workplan to the regulatory agency responsible for overseeing corrective action at the underground storage site." Section 2811 of the Petroleum Underground Storage Tank Cleanup Fund Regulations specify that claimants shall be entitled to reimbursement for costs **only** if they are in compliance with corrective action requirements including the implementing regulations in Article 11. Most regulatory agencies require that a workplan be signed by a properly licensed professional.

Workplans are required for proposed activities under the Preliminary Site Assessment Phase, the Soil and Water Investigation Phase, and the Verification Monitoring Phase.

The types of workplans that are generally prepared for submittal to the regulatory agency for approval are those covering:

- **Phase I/II Site Investigations**
- **Risk Based Corrective Actions (RBCA), Risk Assessment or Fate and Transport Study**
- **Interim Remedial Actions**
- **Community Health and Safety Plans**

The workplan must be approved by the local regulatory agency, or modified until it is acceptable to the agency. This process should, at most, take one or two attempts.

Phase I/II Site Investigations:

The majority of the workplans prepared for a site will be for **Phase I/II Site Investigations**. These workplans provide a narrative of the goals of the investigation activities and how the work will accomplish those goals. The workplan will include a description of the proposed work including: methods, locations, sampling protocols, laboratory analysis, etc. They may, as necessary, include management of contaminated soil and water generated by the activities, contact persons, schedules of the work, interim remedial actions, and community health and safety plans. The actual detail of the workplan will depend upon the scope and type of activity to be conducted. Site Characterization activities such as pump tests, air sparging tests, slug and bail tests, and vapor extraction tests are commonly performed during Phase II activities.

Most workplans contain detailed descriptions of the site and the activities that are to take place. If more than one workplan is prepared, (this happens when two separate and distinct investigative activities take place) much of the detail in the report is duplicated. Word processors allow this information to be duplicated without repeating the initial effort in preparing the report. Once a workplan is prepared for a site, the subsequent plans should take less time, effort, and cost to prepare.

The following is an example of one agency's minimum requirements for a workplan:

Example[1]

Chapter	**Including**
Purpose and scope of work	Narrative: with brief site identification, Regulatory case #, current site conditions, brief descriptions of the goals of the proposed work and how the proposed activities will accomplish these goals. Illustrations: clear illustrations to document the location of the site, current conditions and proposed work. Locations of existing features (utilities, wells, excavations, UST's, adjacent property uses), locations of proposed work, known extent of existing contamination from previous site activities (if any).
Description of proposed work	A description of the work to be performed including (as appropriate): Drilling method, soil sampling intervals, and anticipated total depth of soil borings, anticipated screened interval of monitoring wells, estimated extent of proposed excavations and/or exploratory trenches, estimated amount of soil to be excavated. A description of the sampling strategy and protocol to be followed in the field. Indicate lab analysis to be performed on samples. A description of the protocol to be followed for preservation and transportation of samples, procedures for decontamination of sampling equipment. **The following sections may be added to the description of proposed work as necessary.** A description of how containerized soil and/or groundwater will be managed at the site. If storage is to take place, location must be noted on the plot plan along with a description of how they will be labeled and safely managed. Name, address, phone # and contact name of site where contaminated soils will be transported for treatment/disposal. Time schedule for removal of wastes and media to be properly disposed of at off-site facilities. A description of the protocol used to sample and characterize soil stockpiles for disposal at class III facilities. Alternative on-site uses of contaminated soils which do not impact public health may also be proposed.
Schedule	Schedule of completion of proposed work
The following <u>chapters</u> may be added as necessary.	
Interim Actions	Appropriate interim remedial actions as may be necessary and required by the local regulators.
Health and Safety	May not be necessary for all workplans. Refer to the local regulators, regulations and guidelines for a description of the community health and safety issues that are appropriate.

[1] This is only an example. This is not intended to be interpreted as a requirement of the Fund. Throughout this document various examples are used for illustrative purposes, and are not intended to be interpreted as a requirement of the Fund. Please refer to your local, regional, tri-regional, LUFT manual, or other guidelines as needed for region specific information and requirements.

The following costs are what the Fund would expect to see for the creation of an initial workplan to perform Phase I/II Site Investigations:

Workplan for Initial Phase I/II Site Investigations				
Charge	Description	Units	Rate	Cost
Principal Engineer/Geologist		1	105	105.00
Associate Engineer/Geologist	plan prep., review, disc. w/ regulators, signatures	10	80	800.00
Drafts Person	preparation of maps describing site/activity locations	4	45	180.00
Clerical	typing/reproduction/mailing	6	35	210.00
Total Cost per Report				1,295.00

If the site is not assessed completely in the first attempt, additional workplans may be necessary. The following are the costs that the Fund would expect to see for a subsequent Phase I/II workplan:

Workplan for Subsequent Phase I/II Site Investigations				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	review, disc. w/ regulators, signatures	4	80	320.00
Staff Engineer/Geologist	plan prep., review, disc. w/ regulators, signatures	6	65	390.00
Drafts Person	preparation of maps describing site/activity locations	2	45	90.00
Clerical	typing/reproduction/mailing	3	35	105.00
Total Cost per Report				905.00

Workplan for Risk-Based Corrective Action (RBCA), Risk Assessment, or Fate and Transport Study:

A workplan may be prepared if Risk-Based Corrective Action, Risk Assessment, or Fate and Transport Study is proposed. These studies are not routine in use and acceptability at the time this document was being prepared. Before the costs will be considered, approval of the workplan must be obtained from the regulatory agency. The level of effort and detail required in the workplan will depend upon the site conditions. These workplans may be included within a Corrective Action Plan (CAP), in which case, these costs would be unnecessary. Some areas do not accept these studies, contact the local regulatory official to see if this is an option (see Risk Based Corrective Action, Project Costs, page 25).

Interim Remedial Actions:

Local regulating officials may require interim remedial actions to abate or correct actual or potential effects of an unauthorized release prior to complete delineation. These are usually actions such as free product removal or excavation and removal of severely impacted soils or groundwater to remedy an emergency health and safety situation. Due to the immediacy of the need for interim remedial actions, a workplan may or may not be required by the local agency. In either case, a copy of the local agency directive and approval is part of the required supporting documentation. **The interim remedial actions are not**

intended to replace corrective action or to eliminate the need for the Corrective Action Plan.

Community Health and Safety Plan:

Depending upon the site activities and the requirements of the local regulating officials, a Community Health and Safety Plan may be required as part of a workplan. The majority of the information in these plans does not change from site to site. A company will have standard methods to deal with certain concerns and hazards. These methods are available from previous health and safety plans. They need to be updated to include the correct contact persons, site addresses, dates, hospital locations, etc. One agency's requirements for a Community Health and Safety Plan are shown below:

Example

Should include the following topics. If any of the following requirements are not relevant, please state so clearly in the plan.

1) Site identification and location (case #, site name, address, Assessor's Parcel Number [APN])
2) Plot plan identifying all on-site and surrounding structure, topography, prevailing wind directions, all surrounding land uses, nearby populations, and environments and/or receptors of special concerns
3) Evaluation of potential public exposure to hazards (vapors, dust, noise, fires, explosions, physical hazards, both immediate and long term)
4) Monitoring equipment and protocols to be used
5) Control methods
    a) Site Security
    b) Vapors
    c) Dust
    d) Noise
    e) Open Excavation
    f) Stockpiled Soil
6) Site Safety Manager
7) Emergency Planning
8) Public notification at a minimum should include:
    a) Name and 24 hr phone number for the site safety supervisor
    b) Brief description of the activities
    c) Dates and time of work to be performed and completed
    d) Any requisite Proposition 65 warnings (chemicals known to cause cancer)

Community Health and Safety Plan				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	Review And Signature	1	80	80.00
Project Manager	Preparation And Updates	2	75	150.00
Clerical	Rpt. Prep./Typing/Repro	2	35	70.00
Total Cost Per Report				300.00

Site Investigation

A site investigation involves a comprehensive environmental investigation of a contamination release and typically includes: contaminant characterization, sampling of soil and groundwater, investigation of the site's geologic and groundwater conditions, identification of artificial subsurface and surface structures and an identification of sensitive environmental receptors.

Site investigations can involve numerous methods of investigation using such equipment as: hand augers, backhoes, drill rigs, cone penetrometers, and/or other geophysical investigation equipment. Each site is unique, with different techniques or combinations of techniques required. Other sections of this guideline contain some of the hourly or weekly rates for common investigative equipment (Equipment, Supplies, Drilling). The costs below are the expected labor expended by the consultants and the normal equipment and supplies needed to perform certain tasks.

Permits:

Before some activities can begin, proper permits must be obtained from the permitting agencies. The costs of obtaining the permits vary, but are usually about $50.00 each for borings and wells (these may be significantly higher depending upon local requirements. **Copies of the actual receipt for the permit must be included when submitting for these costs.**

Soil Gas Survey:

Soil Gas Surveys are sometimes performed to obtain an idea of the lateral extent of the contamination and to locate and place borings and monitoring wells efficiently. The **total** costs for a survey is approximately $150.00 per probe. This includes all equipment and hourly costs to place, retrieve, test, and prepare a report covering the results. This will vary depending upon the number of sample points placed.

Cone Penetrometer Test (CPT):

Cone Penetration involves hydraulically pushing a cone shaped instrument into the soil and measuring its resistance to penetration. Hydraulic properties of the soil can be measured. Special samplers can be used to retrieve grab samples of the soil, soil vapor, or groundwater.

Some local agencies may or may not approve the use of a CPT for site investigation. The Fund will not reimburse costs that are not directed and approved. Contact your local regulator prior to performing a CPT to determine if they are acceptable.

Cone Penetrometer Test: Installation of eight (8) CPT probes to thirty (30) feet.

Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist		10	80	800.00
Project Manager		1	75	75.00
Total Labor				875.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Truck	miles	60	0.35	21.00
Total Equipment				111.00
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	240	15	3,600.00
Analytical (8015/8020)	each	8	55	440.00
Markup		4,040	0.15	606.00
Total Sub				4,646.00
Total Cost/Event				5,632.00

Hand Augering:

Many different types of hand augers are used on sites. Hand augers are generally inexpensive, can be operated by one person, and are readily available. The depth is usually limited to less than 20 feet.

Hand Augering: Installation of five (5) augers to ten (10) feet.				
Consulting Costs	Task	Units	Rate	Cost
Project Manager		1	75	75.00
Staff Engineer/Geologist		10	65	650.00
Technician		10	50	500.00
Total Labor				1,225.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Hand Auger	day	1	15	15.00
Truck	miles	60	0.35	21.00
Total Equipment				126.00
Subcontractor	Unit	Units	Rate	Cost
Analytical (8015/8020)	each	6	55	330.00
Markup		330	0.15	49.50
Total Analytical				379.50
Total Cost/Event				1,730.50

Boring Installation:

A common method of underground characterization is the installation of borings. This provides information pertaining to not just the contaminant plume, but also the site lithology and potential pathways, migration, and actions of the contaminant. Proper installation and sampling is required to provide adequate data. Most regulatory agencies have standard requirements regarding the drilling, sampling, and destruction of borings. These requirements must be followed.

Boring Installation: Installation of three (3) borings to thirty (30) feet.

Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist	Field/permit review	3	80	240.00
Project Manager	Scheduling/field/permits	10	75	750.00
Technician	Field/permits/setup	8	50	400.00
Total Labor				1,390.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Barrels	each	8	35	280.00
Truck	miles	60	0.35	21.00
Total Equipment				391.00
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	90	18	1,620.00
Analytical (EPA 8015/8020)	each	15	55	825.00
Markup		2,445	0.15	366.75
Total Sub				2,811.75
Total Cost/Event				4,592.75

Boring Installation: Installation or six (6) borings to fifty (50) feet.				
Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist	Field/permit review	4	80	320.00
Project Manager	Scheduling/field/permits	16	75	1,200.00
Technician	Field/permits/setup	16	50	800.00
Total Labor				2,320.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	2	90	180.00
Visqueen	each	1	61.5	61.50
Truck	miles	70	0.35	24.50
Total Equipment				266.00
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	300	16	4,800.00
Mobile Lab Analytical (45 EPA 8015/8020)	each	1	2,100	2,100.00
Markup		6,900	0.15	1,035.00
Total Sub				7,935.00
Total Cost/Event				10,521.00

Trenching/Test Pits:

Another method commonly used to investigate a site is the excavation of trenches or test pits to examine the site lithology and contaminant locations. The costs for excavating a trench or test pit should follow the soil excavation cost outlined in the Soil Excavation, Project Costs, page 30.

Trench/Test Pit Installation: Installation of thirty (30) feet of trench to fifteen (15) feet.				
Consulting Costs	Task	Units	Rate	Cost
Staff Engineer/Geologist		9	65	585.00
Total Labor				585.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Visqueen	each	1	61.5	61.50
Truck	miles	60	0.35	21.00

Trench/Test Pit Installation: Installation of thirty (30) feet of trench to fifteen (15) feet.				
Total Equipment				172.50
Subcontractor	Unit	Units	Rate	Cost
Backhoe & Operator (excavation)	hour	8	65	520.00
Backfill	cy	35	2	70.00
Analytical	each	6	55	330.00
Markup		920	0.15	138.00
Total Subcontractor				1,058.00
Total Cost/Event				1,815.50

Groundwater Investigation:

The investigation of potential or existing groundwater contamination is usually performed by the installation of wells or obtaining grab samples of the groundwater under the site. Grab samples can be obtained using many methods, an example is given below. The costs for the various methods should be similar.

Hydropunch®[1]: Installation of six (6) sample probes to thirty (30) feet, sampling of groundwater.				
Consulting Costs	Task	Units	Rate	Cost
Project Manager		2	75	150.00
Staff Engineer/Geologist		9	65	585.00
Technician		9	50	450.00
Total Labor				1,185.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Sample Tips		6	30	180.00
Truck	miles	60	0.35	21.00
Total Equipment				291.00
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	180	16	2,880.00
Analytical (8015/8020)	each	9	55	495.00
Markup		3,375	0.15	506.25
Total Subcontractor				3,881.25
Total Cost/Event				5,357.25

[1] Any mention of brand names or specific technologies is not an endorsement of that brand or technology by the State, the Fund, or any of the staff. The mention of brands and names are purely for illustrative purposes.

Groundwater wells are the most common method used to determine aquifer characteristics and contamination. Normally, if contamination is discovered, at least three wells will be required to establish the groundwater gradient. Additional wells may be required to adequately delineate the extent of the contamination.

Groundwater Well Installation: Three (3) borings to thirty (30) feet, converted to two inch monitoring wells.				
Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist	Field/permit review	3	80	240.00
Project Manager	Scheduling/field/permits	9	75	675.00
Technician	Field/permits/setup/develop	12	50	600.00

Groundwater Well Installation: Three (3) borings to thirty (30) feet, converted to two inch monitoring wells.				
Total Labor				1,515.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Barrels	each	8	35	280.00
Truck	miles	60	0.35	21.00
Total Equipment				391.00
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	90	32	2,880.00
Analytical (8015/8020)	each	15	55	825.00
Markup		3,705	0.15	555.75
Total Sub				4,260.75
Total Cost/Event				6,166.75

Groundwater Well Installation: Install six (6) borings to fifty (50) feet, converted to two inch monitoring wells.				
Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist	Field/permit review	4	80	320.00
Project Manager	Scheduling/field/permits	18	75	1,350.00
Technician	Field/permits/setup/develop	16	50	800.00
Total Labor				2,470.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	week	1	148	148.00
Visqueen	each	1	61.5	61.50
Barrels	each	20	35	700.00
Truck	miles	60	0.35	21.00
Total Equipment				930.50
Subcontractor	Unit	Units	Rate	Cost
Driller	feet	300	30	9,000.00
Analytical (8015/8020)	each	35	55	1,925.00
Markup		10,925	0.15	1,638.75
Total Sub				12,563.75
Total Cost/Event				15,964.25

Well Development:

After the installation of groundwater wells, they will need to be developed. The following costs are what might be encountered for this activity.

Well Development				
Consulting Costs	Task	Units	Rate	Cost
Project Manager		2	75	150.00
Technician	develop 3 wells at 30 feet	5	50	250.00
Technician	develop 6 wells at 50 feet	8	50	400.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Barrels	each	1	35	35.00
Pumps	day	1	45	45.00
Level Meter	day	1	15	15.00
Truck	miles	60	0.35	21.00

Well Development	
Total Equipment (3 wells)	186.00
Total Equipment (6 wells)	291.00
Total Cost/ 3 wells at 30 feet	586.00
Total Cost/ 6 wells at 50 feet	841.00

Pilot Tests:

Various pilot tests may be needed to investigate and characterize the site or to plan remedial alternatives. The following tests are commonly performed:

Vapor Test (8 hour): Includes all costs and equipment necessary to complete field work.

Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist		3	80	240.00
Project Manager		8	75	600.00
Technician		10	50	500.00
Total Labor				1,340.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
VES Trailer w/ carbon & equipment		1	500	500.00
Misc.		1	20	20.00
Truck	miles	60	0.35	21.00
Total Equipment				631.00
Subcontractor	Unit	Units	Rate	Cost
Analytical (number may vary depending upon local AQMD requirements) (8015/8020)		2	100	200.00
Markup		200	0.15	30.00
Total Sub				230.00
Soil Vapor Extraction Total Cost/Event				2,201.00
Soil Vapor Extraction with Air Sparging Total Cost/Event				3,001.00

Aquifer Pump Test (48 hour)				
Consulting Costs	Task	Units	Rate	Cost
Senior Engineer/Geologist		4	90	360.00
Associate Engineer/Geologist		22	80	1,760.00
Technician		50	50	2,500.00
Total Labor				4,620.00
Equipment Rental/Supplies	Unit	Units	Rate	Cost
Pump (submersible)	day	3	50	150.00
Datalogger w/ probes	day	3	150	450.00
Storage Tank 1,000 gal	1 month	1	320	320.00
Miscellaneous Supplies	each	1	20	20.00
Truck	miles	60	0.35	21.00
Total Equipment				961.00
Total Cost/Event				5,581.00

Groundwater Monitoring Events

Shown below are costs the Fund would typically expect to see for a quarterly or bi-annual groundwater monitoring event.

Groundwater Monitoring Event: 3 wells at 30 feet				
Labor	Task	Units	Rate	Cost
Project Manager	Scheduling	0.5	75	37.50
Technician	Field	8	50	400.00
Total Labor				437.50
Equipment Rental/Supplies				
Description	Unit	Units	Rate	Cost
Pump	day	1	50	50.00
Water Level Probe	day	1	15	15.00
Bailers	each	3	5	15.00
Truck	miles	60	0.35	21.00
Total Equipment				101.00
Analytical				
EPA Test		Units	Rate	Cost
8015/8020 TPH/BTEX	each	4	55	220.00
Markup		220	0.15	33.00
Total Analytical				253.00
Total Cost/Event				**791.50**

First Periodic Groundwater Monitoring Report for three wells, no other activity conducted this period.				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	Mgmt/Rpt. Prep./Review	3	80	240.00
Staff Engineer/Geologist	Rpt. Prep.	9	65	585.00
Drafts Person	Prepare maps	3	45	135.00
Clerical	Rpt. Prep./Typing/Repro	3	35	105.00
Report Reproduction	RWQCB(1)/EHS(1)/Client(2)	4	3	12.00
Total Cost per Report				1,077.00
Subsequent Report[1]				650.00

[1] Once an initial report is prepared for a site, the subsequent reports should take less effort to prepare.

Groundwater Monitoring Event: 6 wells at 50 feet				
Labor	Task	Units	Rate	Cost
Project Manager	Scheduling	0.5	75	37.50
Technician	Field	12	50	600.00
Total Labor				637.50
Equipment Rental/Supplies				
Description	Unit	Units	Rate	Cost
Pump	day	2	50	100.00
Water Level Probe	day	2	15	30.00
Bailers	each	6	6	36.00
Truck	miles	60	0.35	21.00
Total Equipment				187.00

Groundwater Monitoring Event: 6 wells at 50 feet				
Analytical				
EPA Test		Units	Rate	Cost
8015/8020 TPH/BTEX	each	7	55	385.00
Markup		385	0.15	57.75
Total Analytical				442.75
Total Cost/Event				**1,267.25**

First Periodic Groundwater Monitoring Report for six wells, no other activity conducted this period.				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	Mgmt/Rpt. Prep./Review	3	80	240.00
Staff Engineer/Geologist	Rpt. Prep.	12	65	780.00
Drafts Person	Prepare maps	4	45	180.00
Clerical	Rpt. Prep./Typing/Repro	4	35	140.00
Report Reproduction	RWQCB(1)/EHS(1)/Client(2)	4	3	12.00
Total Cost per Report				1,352.00
Subsequent Reports[1]				815.00

[1] Once an initial report is prepared for a site, the subsequent reports should take less effort to prepare.

Free Product Removal

Free product is often found in wells on significantly contaminated sites. It is the petroleum product that resides in the spaces between the soil particles or floats on top of the groundwater and is generally more accessible for removal or treatment. The removal of free product may be conducted by several methods. A dedicated free product removal device may be installed in the wells to continuously remove free product (see Equipment (Small) for skimmers / separators). Most of these types of systems require very little maintenance, but do require periodic emptying. The amount of time and frequency of site visits is based upon the severity of the free product problem and the capabilities of the device used.

A technician is normally used to empty and record free product levels or amounts. A technician may also perform manual free product removal from a well utilizing a bailer. The amount of time this takes will be dependent upon the number of wells and the amount of the free product. Many alternatives exist to repeating expensive tasks, the Fund encourages creativity and innovation in removing free product (some agencies have had good results training claimants to bail their own wells as needed).

Caution must be used when considering extensive and regular manual free product removal episodes. The cost of removing free product manually can quickly exceed the purchase, operation, and maintenance costs of a dedicated free product removal system. The Fund expects the most cost effective alternative to be followed.

Free Product Removal:				
Activity	Description	Unit	Rate	Cost
Empty and record level in a skimmer	Technician (hours)	2	50	100.00
	Interface Meter	1	25	25.00
	Vehicle (miles)	60	0.35	21.00
	Total (event)			146.00
Manual free product removal incident	Technician (hours)	2	50	100.00
	bailer (each)	1	6	6.00
	Interface Meter	1	25	25.00
	Vehicle (miles)	60	0.35	21.00
	Total (event)			152.00

Report Preparation

Throughout the process of investigation and remediation of a release from an underground storage tank, many reports will be prepared and submitted to the different regulating agencies. Basic reports that will be required on most sites include: Site Investigation Reports, Reports of Field Activities/Quarterly Reports. Most agencies require the signature of a registered professional on all reports.

Certain sections of some reports may be excerpted from other reports with little or no modification (e.g., sampling protocol followed for drilling or groundwater sampling, health and safety protocols followed, etc.).

Periodic Monitoring Report:

The most common report that is required on almost all groundwater impacted sites is the Quarterly Monitoring Report. A Quarterly Monitoring Report is normally submitted each quarter (every three months), as the name suggests, to the local regulating agency and/or the Regional Water Quality Control Board (RWQCB). Other reporting schedules include semi-annual (twice a year) or annual (once a year) and are similar to the quarterly reports. The periodic report should cover all activities and occurrences at the site since the last reporting episode. The report may cover extensive actions such as well installation and remediation system operation, or it may be a simple statement of no activity taking place on the site for various reasons.

Most regulatory agencies require a certain amount of detail in these reports. A large amount of this detail is duplicated from report to report. The location, geology, hydrogeology, sampling protocols should not change significantly. The tables and maps need to be updated if they include new data, but no major changes are normally needed. The appendices of the document may be from other sources (e.g., sample results from the laboratory) or duplicates (e.g., standard sampling protocol followed).

The following is an example of one agency's requirements for quarterly monitoring reporting:

Example

Graphic Presentation

Include site maps (plot plans) that are drawn to a scale that remains consistent from one reporting period to the next. The maps shall include:

a) Potential contaminant sources
b) Well locations
c) Groundwater elevation contours
d) Groundwater flow direction(s)

e) Extent of phase separated product
f) Extent of dissolved chemical constituents
g) A North arrow

Selected analytical results should be included on the plot plan. The use of line or bar graphs are helpful to illustrate variations in groundwater elevations, phase separated product thickness, and dissolved chemical concentrations with time. New cross sections are recommended if the previous interpretation of subsurface conditions have changed.

Tabular Presentation

All the following data should be presented in table(s) to show a chronological history and allow quick and easy reference.

a) Well designations
b) Well construction, including: well casing elevation, total casing and screen depth, depth to top of screen
c) Groundwater depth
d) Groundwater elevation
e) Phase separated product elevation
f) Phase separated product thickness
g) Purge volumes
h) Analytical results
i) Measurement dates

Discussion

Present a discussion of the field and laboratory results including:

a) Conclusions
b) Data anomalies
c) Variations from protocols
d) Conditions of wells including vaults and seals
e) Management of drill cuttings and purge water
f) Data interpretations
g) Recommendations

Appendices

a) Complete analytical laboratory reports
b) Well purging and sampling documentation, including: equipment used, date and time, and on-site water quality measurements
c) Decontamination procedures
d) Field quality assurance/quality control methods
e) Sample preservation
f) Documentation of: product volumes recovered/disposed, disposal of well development purge water, disposal of drill cuttings (documentation should include either a copy of the hazardous waste manifest and/or bill of lading)

A periodic report is often supplied to the local regulatory official as a regular update report. It often includes such things as: regular monitoring, remediation equipment reporting and efficiency evaluation, recommendations for further assessment, recommendations for closure, and other information of interest to the local regulatory official. Once an initial report is prepared for a site, the subsequent reports should take significantly less effort to prepare. As additional items, activities, and descriptions are included, the labor and cost will

increase. The following are costs the Fund would expect to see associated with basic report preparation.

First Periodic Groundwater Monitoring Report for three wells, no other activity conducted this period.				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	Mgmt/Rpt. Prep./Review	3	80	240.00
Staff Engineer/Geologist	Rpt. Prep.	9	65	585.00
Drafts Person	Prepare maps	3	50	150.00
Clerical	Rpt. Prep./Typing/Repro	3	35	105.00
Report Reproduction[1]	RWQCB(1)/EHS(1)/Client(2)	4	3	12.00
Total Cost per Report				1,092.00
Subsequent Reports				650.00

[1] The quarterly report normally takes the form of a "letter" report, stapled, without binding, to the concerned parties. Reproduction charges are based on a 20 page report (includes discussion, maps, tables, lab reports).

Although no activity may have taken place, quarterly reporting may still be required. If this is the case, a one page letter to the regulatory agency will normally suffice. The costs below are the maximum the Fund would expect to see for this type of activity.

Initial Periodic Update Report for no activity conducted this period.				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	Mgmt/Rpt. Review	1	80	80.00
Clerical	Rpt. Prep./Typing/Repro	1	35	35.00
Total Cost per Report				115.00
Subsequent Reports				65.00

Site Investigation Reports:

Most site investigation reports are detailed regarding the site and the activities that took place. If more than one investigation report is prepared, this happens often when two separate and distinct investigative activities take place, much of the detail in the report is duplicated.

The following is an example of one agency's requirements for site investigation:

Example

Chapter	Including
Summary	conclusions and recommendations, horizontal and vertical extent of contamination, additional assessment recommendations, mitigation alternatives.
Site Identification	address, name, business, AEP, DEH #, owner, operator, RP, contact person, location
Site History	historical use, current use, future use, adjacent uses
Description of Release	substance, characteristics, quantity, how and when occurred and abated, location
Site Plot Plan	drawn to scale, north arrow, streets, structures, utilities, excavation and stockpile locations, tank and piping (past, existing, proposed), well, boring and samples, legend and abbreviations.
Geology	local, site, topography
Hydrogeology	surface drainage and water bodies, basin plan, hydrographic unit and subunit, groundwater elevations and gradient, migration patterns, sources of information

Delineation of Contamination	summary of analytical data with locations, analysis, and results, maps and cross sections showing extent of contamination, potential sources, pathways, boring locations, lithology, water table, groundwater contours, environmental parameters, man-made features, and estimated volume and mass of contaminated substances.
Exposure Concerns	migration and natural pathways (air, soil, surface water, bedrock fractures, groundwater, etc.), man-made pathways (conduits, utilities, vaults, piping, storm drains, etc.), impacts on biological receptors (people, plants, animals), potential nuisance, water wells
Sampling	protocol, methods, preservation and transport, analysis, chain-of-custody, matrix, lab reports, quality assurance/quality control
Stockpile Management	volume, location, methods to prevent run-off or public access, disposal methods, copies of manifests
Site Safety	safety and security description, community health and safety, monitoring equipment, protective equipment, public agency notification, utility notifications
Signature and Registration	signatures of preparers, signatures and stamps of registered professionals in responsible charge of site activities, authorized signature of company preparing report
Appendix	well boring logs, manifests, permits (APCD, Fire Department, Wells, etc.), lab data sheets, chain-of-custody forms

As can be seen above, certain standard items vary little from report to report. Reports from different sites may also have similarities. The Fund expects to reimburse for **new and original work**, not repeated information.

The amount of effort by various staff may vary slightly for different types of activities, but the end cost should be roughly the same. Shown below is what the Fund would expect to see for a normal report regarding site assessment activities.

Site Assessment Report for six (6) borings to thirty (30) feet with three converted to monitoring wells				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	report prep./review/signature	4	80	320.00
Staff Engineer	report prep./review	10	65	650.00
Drafts Person	map/boring log preparation	8	45	360.00
Clerical	report prep./tables/typing/repro	6	35	210.00
Report Reproduction	RWQCB(1)/EHS(1)/Client(2)	4	8	32.00
Total Cost per Report				1,572.00

Corrective Action Plan (CAP) Preparation

Section 2811(b) of the Petroleum Underground Storage Tank Cleanup Fund Regulations specify that corrective action **costs incurred after December 2, 1991 are reimbursable only if the work was done in compliance with applicable corrective action requirements "including the implementing regulations in Article 11, Chapter 16, Division 3, Title 23, California Code of Regulations".** The necessity of preparing a Corrective Action Plan (CAP) before initiating corrective action is a part of the Article 11.

The preparation of a corrective action plan (CAP) that adequately evaluates the appropriate remediation technology alternatives is an important step in the corrective action process. The CAP is conducted after the implementation of the preliminary site assessment and soil and water investigation phases and after the local regulatory agency has concurred that the lateral and vertical extent of contamination have been assessed. The CAP, if conducted properly, can effectively incorporate all past regional and site-specific data and develop the most cost-effective remediation method.

Some interim remedial action has led to unnecessary and unreasonable costs because it was used to bypass investigation and CAP implementation. Such costs are not reimbursable. An example of excessive interim remedial actions might occur immediately after the underground storage tank removal and the unauthorized release has been detected when the contaminated soil is overexcavated and stockpiled. Normally interim excavation involves the removal of obvious contaminated soil; however, the Fund has seen overexcavation involve thousands of cubic yards of soil. Without proper sampling, characterization, regulatory directives, workplans, and consideration for cost effectiveness this may result in unreasonable costs. A clear delineation needs to be made between interim remedial action and the full-scale remedial action. The Fund will only reimburse for the amount of the most cost-effective method.

The regulations in Article 11 are explicit about what the minimum requirements are for a Corrective Action Plan (CAP). Different regulatory agencies may have additional requirements, or clarifications on what they expect a CAP to include. According to Article 11 (Title 23, Division 3, Chapter 16, California Code of Regulations, §2726: Corrective Action Implementation Phase), the CAP must include the following elements:

1. **Assessment of the Impacts:**
   The majority of assessment of the impact data is typically collected during the preliminary site assessment and soil and water investigation phases and is incorporated into the CAP. This is not a major cost of the CAP because the data

was generated in previous investigations. The assessment of impacts consists of, but is not limited to:

- physical and chemical characteristics of the hazardous substance or its constituents, including their toxicity, persistence and potential for migration in soil, water, and air;
- hydrogeologic characteristics of the site and the surrounding area where the unauthorized release has migrated or may migrate;
- proximity and quality of nearby surface water or groundwater, and the current and potential beneficial uses of the waters; and
- potential effects of residual contamination on nearby surface and ground waters.

2. Feasibility Study:

A feasibility study is conducted to evaluate various alternatives for remedying or mitigating the actual or potential adverse impacts of the unauthorized release. Each individual remedial method considered must be evaluated for cost-effectiveness. The responsible party is required to propose and implement the most cost-effective corrective action alternative.

The feasibility study shall consist of the following:

- each recommended alternative be designed to mitigate nuisance conditions and the risk of fire or explosion;
- where the unauthorized release affects or threatens waters with current or potential beneficial uses designated in water quality control plans, the feasibility study is required to identify and evaluate at least two alternatives for restoring or protecting the beneficial uses;
- where the unauthorized release affects or threatens waters with no current or potential beneficial uses designated in water quality control plans, the feasibility study is required to identify and evaluate at least one alternative for restoring or protecting the beneficial uses;

3. Cleanup Levels:

Cleanup levels for ground or surface water will vary from site to site. This is caused by different waste discharge requirements, water quality control plans, or regulatory agency requirements. Applicable cleanup levels should meet the following requirements:

- Waters with current or potential beneficial uses for which numerical objectives have been designated in water quality control plans, the responsible party shall propose at least two alternatives to achieve these numerical objectives;
- Waters with current or potential beneficial uses for which no numerical objectives have been designated in water quality control plans, the responsible party shall recommend target cleanup levels for long-term corrective actions to the regulatory agency for concurrence. Target cleanup levels are required to be based on assessment of the impacts investigation.

Check with your local regulator regarding policies, requirements, and expectations regarding the use of Corrective Action Plans for your site.

A CAP is not appropriate without an adequate assessment of the lateral and vertical extent of the contamination. For this discussion it is assumed that the site has been adequately assessed and characterized. All necessary field work has been conducted to adequately address the site, the characteristics of the hazardous substance, and the locale and potential impacts on beneficial use water.

The level of effort and detail necessary for each CAP will vary depending upon the site conditions, the contamination, and the requirements of the local regulatory officials. For example: a site with minimal contamination that is well defined and does not extend far below the surface may be remediated with a minimal CAP, while a site with extensive groundwater contamination from multiple sources to a greater depth may need a more extensive CAP. It is important to be sure that your proposals and the level of detail that will be required in the CAP are in accordance with the requirements of the local regulator.

The following is an example of one agency's requirements for implementing the **Corrective Action Plan requirements from Article 11** of the Underground Storage Tank Regulations:

Example

Assessment of the impacts: A CAP is based upon an adequate assessment of the impacts. If a CAP is requested before assessment is completed, then the completion of the site assessment will be part of the CAP. At a minimum it includes:

a) Hydrogeologic characteristics of the site, includes:

1) Indicate current and potential beneficial uses of the ground and surface waters
2) Tabulate existing groundwater data, including existing well gauging data and construction details
3) A narrative description of the topographic characteristics in the vicinity of the site
4) A map illustrating #3) above and location of groundwater supply wells in vicinity
5) Narrative description of the lithology of the site
6) Cross section of the lithologies present at the site
7) Map(s) illustrating groundwater flow direction and gradient
8) Discussion of the groundwater data in regional context, considering regional climatic cycles

b) Contaminant Characteristics includes:

1) Identify the contaminants of concern at the site, tabulate existing contamination data, provide analysis of trends in contaminant contamination
2) Narrative description of the chemical and physical characteristics of the contaminants, discuss toxicity, persistence, and potential migration
3) Impacts of the contaminant at the site to the soil, groundwater, surface water and air. Impacts to utilities. Provide maps and cross sections of contaminant plumes
4) Description of **potential** impacts of the contamination at the site. Prior to initiating a Fate and Transport study, contact the local regulator.

Determination of applicable cleanup levels: Cleanup levels for groundwater, surface water, and soil are performance standards to be considered when completing a feasibility study. Strategies considered must be technically capable of reaching the established level. Local regulatory agency approval must be obtained for any target level prior to implementing corrective action.

a) Cleanup levels for groundwater or surface water in areas with designated current or potential **beneficial uses**:
§2725(g) requires that areas in designated beneficial uses, the numerical objectives designated in the water quality control plan (as determined by the Regional Water Quality Control Board) for any particular contaminant will constitute the maximum contaminant level for that contaminant. In areas for which a water quality control plan has no numerical objectives, the responsible party shall propose target cleanup levels that are consistent with other water quality control plans.

b) Cleanup levels for groundwater or surface water in areas with no designated current or potential beneficial uses (**non-beneficial use areas)**:
The responsible party shall propose target cleanup levels for ground and surface water based upon the assessment of the impacts, typically based upon risks to public health and safety and potential vapor migration.

c) Cleanup levels for **soil** (if applicable):
The responsible party shall propose soil cleanup levels that ensure that any remaining mobile/leachable constituents of concern do not cause waters to exceed applicable target levels. Must ensure any remaining constituents do not pose a threat through the soil of vapors.

Feasibility Study and Workplan: In areas designated **beneficial use,** or where the waters are being used, the feasibility study must evaluate the appropriateness and cost-effectiveness of at least three alternatives. Where no designated or current or potential beneficial uses have been designated, at **least** two alternatives must be considered. All alternatives considered must be capable of achieving the target cleanup levels established. At times, circumstances may be such that the "no action" or long term "passive bioremediation" alternatives might be considered suitable for evaluation in the feasibility study.

a) A description of each proposed corrective action strategy.

b) A justification for the selection of each corrective action strategy as an appropriate method to restore or protect existing or potential beneficial uses and to protect human health.

c) An estimate of the time required to complete remediation for each corrective action strategy.

d) A comparative analysis of the **total costs** of each corrective action strategy. Should be presented in terms of starting and operating costs.

e) A selection of the most cost-effective strategy and the preparation of a detailed workplan describing the specific tasks to be performed in implementing the selected remediation alternative.

Monitoring and Reporting of CAP Effectiveness: The responsible party must propose a strategy for monitoring and evaluating the effectiveness of the corrective action. Describe the key indicators and the monitoring methods to be used in evaluating the effectiveness of the work. Also describe the criteria to be used in determining when site cleanup is complete, or when the corrective action has become ineffective. The responsible party should propose a schedule for reporting, in writing, the monitoring data and an evaluation of the results of such monitoring. Local agency approval must be obtained prior to implementing corrective action. The monitoring requirements may be modified, if new conditions make it necessary, with the concurrence of the local agency.

The following common costs are for a complete CAP covering extensive contamination. Basic sites with no groundwater contamination are less expensive.

Corrective Action Plan Preparation Costs: Basic site with moderate groundwater and soil contamination.				
Consulting Costs	Task	Units	Rate	Cost
Senior Engineer/Geologist	Plan Review/Signature	3	90	270.00
Associate Engineer/Geologist	Plan Prep./Managment/Review	18	80	1,440.00
Staff Engineer/Geologist	Plan Prep.	12	65	780.00
Drafts Person	Map/Diagram Prep.	6	45	270.00
Clerical	Rpt Prep/Repro	8	35	280.00
Report Reproduction/Binding	RWQCB(1)/EHS(1)/Client(2)	4	20	80.00
Total Cost				3,120.00

Corrective Action Plan Preparation Costs: Complicated site with extensive groundwater and soil contamination, difficult hydrogeology, multiple contaminants, and above ground complications.				
Consulting Costs	Task	Units	Rate	Cost
Principal Engineer/Geologist	Plan Review/Signature	5	105	525.00
Senior Engineer/Geologist	Plan Review/Signature	10	90	900.00
Associate Engineer/Geologist	Plan Prep./Managment/Review	25	80	2,000.00
Staff Engineer/Geologist	Plan Prep.	10	65	650.00
Drafts Person	Map/Diagram Prep.	15	45	675.00
Clerical	Rpt Prep/Repro	10	35	350.00
Report Reproduction/Binding	RWQCB(1)/EHS(1)/Client(2)	4	20	80.00
Total Cost				5,180.00

The actual costs will vary significantly depending upon site conditions and local agency requirements.

The completed and approved CAP should be used as a basis for obtaining three bids for the remediation phase of the site cleanup (see Three Bid Requirement, Policies Section, page 12).

Remedial Action Plan (RAP) Preparation

A Remedial Action Plan (RAP) is developed if the workplan included in the Corrective Action Plan requires additional design specification to allow the regulators to fully approve the chosen remedial alternative. A RAP completes the design of the chosen remedial alternative for approval by the local regulatory official. In some cases the "Remediation Workplan" or RAP may be part of the Corrective Action Plan. Most agencies do not require a Remedial Action Plan in addition to the Corrective Action Plan.

The following is an example of one agency's requirements for a Remedial Action Plan:

Example

Each of the following topics should be discussed in a "Remediation Workplan". If any of the topics do not apply to your situation, provide an explanation in the workplan.

a) Site Identification
   1) Complete site address and phone number
   2) Name and type of business or description of current site use
   3) Assessor's Parcel Number (APN)
   4) Property owner's name, mailing address, and phone number
   5) Responsible Parties name, mailing address, and phone number
   6) Consultant's name, address, and phone number
   7) Contact person's name, mailing address and phone number (if different from above)
   8) Local regulator's case number
   9) EPA identification/generator number

b) Summary of Site Assessment
   1) A brief description of the site assessment including: type of contamination matrix (e.g., soil, sludge, groundwater), table of laboratory data, cross sections (showing: vertical extent of contamination, sample locations, contaminant concentrations, water table elevation, lithology, location of tanks, piping, dispensers, and other possible sources), map (showing: the horizontal extent of contamination, sample locations, contaminant concentrations, gradient, location of tanks and dispensers, etc.), maximum and average concentration of contaminants, estimated volume of contamination to be treated, estimated volume of matrix to be treated.
   2) Description of past, present, and future property uses
   3) Map showing adjacent land use(s) (e.g., residential, commercial, etc.) drawn to scale
   4) Vicinity map showing schools, hospitals, and any other sensitive locations within a one-mile radius of the site
   5) Location and use of all known water wells on the site and within a 1,000 foot radius of the site

c) Treatment System
   1) Statement of qualifications of treatment system designed including past experience(s) using the proposed system on similar contaminants and matrices
   2) Treatment system design, type of equipment and operation specifications
   3) Treatment system flow chart and logic control flow diagram
   4) Plot plan showing location and arrangement of treatment system on the site
   5) Proposed treatment project schedule (time-line)
   6) Description of monitoring method to be used to measure treatment system effectiveness during operation, and frequency of system checks
   7) Hours of operation

8) Sound and noise attenuation, if necessary
9) Plot plan showing the contamination distribution prior to initiation of the treatment system process

d) Community Health and Safety Plan
1) See Community Health and Safety Plans under "Workplans"

e) Agencies Which May Require Permits or Notifications
1) Local Department of Environmental Health (DEH)
2) Regional Water Quality Control Board (RWQCB)
3) Local Air Pollution Control District (APCD)
4) California Environmental Protection Agency (Cal-EPA)
5) California Occupational Safety and Health Administration (Cal-OSHA)
6) Fire Department
7) Sanitary District
8) Building/Planning Departments

f) Verification Sampling Plan

Many of the items listed above were prepared for the Corrective Action Plan. The only difference is the completion of the system design. The costs shown below are what the Fund would expect to see for a basic Remedial Action Plan (RAP), if it is required by the local regulatory official. More extensive RAP's may require additional work with an associated increase in costs.

Remedial Action Plan Preparation Costs: Basic site with moderate groundwater and soil contamination.

Consulting Costs	Task	Units	Rate	Cost
Associate Engineer/Geologist	Rpt. Prep./Review/Signature	10	80	800.00
Staff Engineer/Geologist	Rpt. Prep.	12	65	780.00
Drafts Person	Maps	4	45	180.00
Clerical	Typing/Repro.	4	35	140.00
Report Reproduction/Binding	RWQCB(1)/EHS(1)/Client(2)	4	20	80.00
Total Cost				1,980.00

Remedial Action Plan Preparation Costs: Complicated site with extensive groundwater and soil contamination, difficult hydrogeology, multiple contaminants, and above ground complications.

Consulting Costs	Task	Units	Rate	Cost
Senior Engineer/Geologist	Rpt. Prep./Review/Signature	12	90	1,080.00
Associate Engineer/Geologist	Rpt. Prep./Review/Signature	20	80	1,600.00
Staff Engineer/Geologist	Rpt. Prep.	12	65	780.00
Drafts Person	Maps	8	45	360.00
Clerical	Typing/Repro.	4	35	140.00
Report Reproduction/Binding	RWQCB(1)/EHS(1)/Client(2)	4	20	80.00
Total Cost				4,040.00

Before preparing a RAP, be sure the costs have been pre-approved by the Fund. This should normally take place as part of the pre-approval of general corrective action costs.

Risk-Based Corrective Action, Low Risk Sites

Risk-Based Corrective Action:

Risk-based decision making is a mechanism for identifying necessary and appropriate action throughout the corrective action process. It is a methodology of tailoring corrective action requirements and oversight to the conditions, and actual or potential risk, existing at a UST release site.

The American Society for Testing Materials (ASTM) has developed a Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (E-1739-95) that may be acceptable to some local agencies. Check with your local regulator if this option is available or feasible for a particular site.

Risk Assessment, Fate and Transport Study:

Risk assessment is one tool to use when the cleanup levels are neither technically or economically feasible, or to determine if cleanup is even necessary. A Risk Assessment is used to determine acceptable risk to human health and the environment. The three basic parts of a Risk Assessment are; exposure assessment (including fate and transport study), toxicity assessment, and risk characterization.

A Fate and Transport study is designed to provide a method to objectively estimate the effects of natural processes on the stability and the distribution of contaminants on the environment. The basic reasons a fate and transport study may be performed are; to demonstrate that the existing contamination does not pose a threat (as part of a risk assessment), to demonstrate that the residual contamination does not pose a threat, as part of assessing the impacts from residual contamination to nearby surface and groundwater resources as part of the preparation of a Corrective Action Plan

Low Risk Sites

Some agencies in California are moving aggressively to close or seriously curtail remediation on low risk sites. Contact your local regulator to see if your site qualifies as a low risk site.

The actual costs for performing Risk-Based Corrective Action, preparing a Risk Assessment or Fate and Transport study, or obtaining closure based upon a low risk designation are highly variable. They will vary depending upon the site conditions, the contaminant, and the requirements of the local regulatory officials. The Fund will deal with the costs of these studies on a case-by case basis. Contact the Fund staff for pre-approval and eligibility consideration before implementation.

Passive Bioremediation

Utilization of passive bioremediation, also called natural attenuation or intrinsic bioremediation, is often a viable remediation alternative where the risk of exposure to contaminants is within acceptable limits. This method of remediation takes advantage of naturally occurring subsurface microorganisms that use the petroleum hydrocarbons as a food source to metabolize and degrade it into carbon dioxide and water. This effectively neutralizes any health, safety, or environmental threat of the contamination.

Since this is a naturally occurring phenomenon, it requires little active or costly remedial actions other than monitoring the natural processes. It is important to show that bioremediation is actually occurring. There are three primary methods to quantify the extent of passive bioremediation: compound disappearance, reduction of oxygen, nitrate, and sulfate concentrations relative to background concentrations, and degradation byproducts such as increases carbon dioxide. A risk assessment may be needed to show that the plume will not create a hazard to human health, safety, or the environment during passive bioremediation.

At this point the actual costs of monitoring passive bioremediation are highly variable. In many groundwater cases periodic monitoring will be required (see Groundwater Monitoring Events, Project Costs, page 11), in other cases no monitoring may be required. Monitoring is relatively simple and can be achieved using conventional and cost effective methods. Depending upon the monitoring and verification requirements of the local regulatory agency, costs will vary significantly.

Contact Fund staff for pre-approval of costs and eligibility consideration before initiating passive bioremediation.

Groundwater Treatment System

Some of the more common methods of groundwater remediation for petroleum underground storage tank releases are shown below. An approved Corrective Action Plan (CAP) must be prepared describing the chosen method. The CAP is used as the basis to solicit multiple bids from consultants and contractors.

Specific pieces of equipment used in these methodologies are often expensive and are covered under the Rental/Purchase of Equipment, Policies Section, page 7. The costs of the design for the systems may be found in the preparation of the CAP or the Remedial Action Plan (RAP) depending upon agency **requirements**. Installation costs of the equipment will depend upon the site, the equipment being installed, and the requirement of the local regulating agencies. **Be sure to contact the Fund for pre-approval of these costs before incurring them.**

In Situ Air Sparging with Soil Vapor Extraction:	Air is injected into the saturated zone. The air forms bubbles that rise into the unsaturated zone, carrying trapped and dissolved contaminants. Extraction wells in the unsaturated zone capture sparged air. If necessary, the air can be treated using a variety of vapor treatment options.
Costs:	Vary widely depending upon site specifics, contact Fund staff for pre-approval.
In Situ Bioremediation:	Removes biodegradable contaminants from groundwater. Relies upon microorganisms and supplemental oxygen and nutrients to break down petroleum products in the groundwater. This method is still considered unproven and will require excellent and complete documentation.
Costs:	Vary widely depending upon site specifics, contact Fund staff for pre-approval.
In Situ Bioventing with Low Flow Air Sparging:	Also known as biosparging. Stimulates the aerobic biodegredation of organic contaminants in groundwater by delivering oxygen to the saturated and unsaturated zones. The oxygen is delivered at a slow rate to encourage biodegredation rather than volatilization. Reduces air emissions and remediates the volatile organic compounds in place.
Costs:	Vary widely depending upon site specifics, contact Fund staff for pre-approval.
Vacuum Enhanced Pump and Treat:	Uses a surface-mounted vacuum pump to remove contaminated soil vapors and groundwater at the same time. Increases the rate of pumping, reducing remediation time. The pumped water and soil vapors can be treated with various techniques.
Costs:	Vary widely depending upon site specifics, contact Fund staff for pre-approval.
Pump and Treat:	Brings contaminated groundwater above the ground though the use of extraction wells. The water is then treated, normally using one of three processes: Granular activated carbon, air stripping, or bioremediation. May be used in conjunction with soil vapor extraction to enhance the removal of volatile organic compounds from the zone of water table fluctuation.
Costs:	Vary widely depending upon site specifics, contact Fund staff for pre-approval.
Other Technologies:	These will be dealt with on a case-by-case basis. Costs vary widely depending upon site specifics, contact Fund staff for pre-approval.

Operation and Maintenance (O&M) of Remedial Systems

Costs of operation and maintenance (O&M) of groundwater and soil remediation equipment will vary depending upon the local permit requirements, the type of equipment being used, and the local conditions. The costs shown below are for typical systems. An actual description of the number of hours and the costs incurred in operation and maintenance is required. This means a log of the hours spent by technicians working on the system, a description of the parts used, and an explanation of any unusual charges is required.

The cost of operation depends upon the type of fuel being used. A catalytic oxidizer may use electricity. An internal combustion unit (ICU) may run off gasoline, or natural gas. The choice of fuel should be based upon availability and cost effectiveness. **The cost of operation and maintenance is part of the necessary considerations when choosing a cost effective remediation alternative.** It is not unusual for a system, and the type of fuel it uses, to change during the operation (e.g., exchanging the ICU for a catalytic oxidizer when the contaminant level drops). The utility charges for the operation of the system must be readily identifiable if they are to be reimbursed. A dedicated line, storage, and/or meter may be needed. The fuel should be billed directly to the claimant to avoid unnecessary markup, billing, and confusion.

Different systems will require different types of sampling from the Air Pollution Control District (APCD), Regional Water Quality Control Board (RWQCB), or City or County Environmental Health Services (EHS). **Copies of the local agency's requirements are part of the necessary supporting information**. Normally, the sampling will be daily or weekly during a startup period, decreasing to, at most, monthly sampling when the system is in operation. For a system that is in operation over a period of time, quarterly sampling may be in order. Yearly review of sampling periods and constituents is not unusual.

System efficiency evaluations are performed at regular intervals to ensure the system is operating efficiently and effectively. These are used to determine if the system should continue operation, needs to be modified, or terminated.

The examples of labor, supplies, and analytical costs which follow are for systems with one (1) extraction well and three (3) observation wells. Site visits are weekly with reporting quarterly (during the normal quarterly monitoring events). The systems are in full operation with a once per month sampling cycle.

The following is an example of costs for monthly operation of a soil vapor and groundwater extraction system.

System Operation and Maintenance:				
Consulting Costs				
Labor	Task	Units	Rate	Cost
Technician (1/6/90)	regular field maint./log	4	50	200.00
Technician (1/13/90)	reg. field maint./log	3	50	150.00
Technician (1/20/90)	reg. field maint./log	3	50	150.00
Technician (1/27/90)	Replace vacc gauge/oil change/reg. maint/log	4	50	200.00
Equipment	Description			
Truck (1/6/90)	Office to site/back	60	0.35	21.00
Truck (1/13/90)	Office to site/back	60	0.35	21.00
Truck (1/20/90)	Office to site/back	60	0.35	21.00
Truck (1/27/90)	Office/site/hardware store/site/office	75	0.35	26.25
Total Consulting Costs				789.25
Supplies				
Description	Unit	Units	Rate	Cost
Vacuum gauge replace, old one inoperable due to accumulated deposits.		1	19.88	19.88
Markup on vacc gauge (see attached invoice)		0.1	19.88	1.99
Oil and filter (4 qts 10-40, 1 filter)		1	20	20.00
Total Supplies				41.87
Analytical				
EPA Test		Units	Rate	Cost
8015/8020 Air	each	3	100	300.00
8015/8020 Water	each	3	55	165.00
Markup (see attached invoice)		465	0.15	69.75
Total Analytical				534.75
Total Consulting				789.25
Total Supplies				41.87
Total Analytical				534.75
Total Cost/Month				1,365.87

The costs of replacement parts and supplies should be billed as they are needed and used. Below are the costs for some common remedial supplies that are needed to continue system operation.

O&M Supplies		
	Replacement Granular Activated Carbon (GAC) (Liquid Phase) per pound	1.21
	Replacement Granular Activated Carbon (GAC) (Vapor Phase) per pound	1.35
	Miscellaneous Repair Parts	At Cost

Soil Excavation

Many excavation contractors bill on a time and materials basis because site conditions change the actual costs. These tables **should be used for general evaluation of excavation costs only.** Site conditions change the actual costs; complete and full justification and hourly breakdown are needed for all sites. Rates for some of the basic equipment used in this type of activity can be found in Equipment (Heavy), Unit Costs, page 9.

Contact the Fund staff for pre-approval of these costs prior to incurring them.

Segregation of clean and contaminated soil, and stockpile characterization are very important. The Fund will **not** reimburse costs for remediation of non-contaminated soil.

Site Preparation/Replacement			
Activity	**Unit**	**2" Asphalt**	**6" Concrete**
Remove pavement	per square foot	0.50	1.50
Replace pavement	per square foot	1.00	2.50

Excavate and segregate overburden and contaminated soil		
Activity	**Unit**	**Cost/unit**
Excavate	per cubic yard	5.00
Replacement Material[1]	per cubic yard	2.00
Compaction[1]	per cubic yard	3.00

[1] Clean fill is often available at little or no cost. Many off-site remedial facilities provide backhauling of clean material at minimal or no cost. The need for expensive materials in backfill and compaction may need justification depending upon the situation. In the case of compaction, a copy of the permit requiring the compaction is part of the required documentation.

Stockpiles are typically characterized using EPA methods 8015/8020 (TPH) or 418.1 (TRPH) tests. The costs for these types of tests can be found in Analytical, Unit Costs, page 2. The example shown below is one agency's requirements for stockpile characterization.

Stockpile Characterization: Different regulatory agencies have different requirements regarding the adequate characterization of stockpiles, check with your local agency for their stockpile requirements.	
Stockpile Size	**Minimum Number of Samples**
less than 10 cubic yards	2
10 to 20 cubic yards	3
20 to 100 cubic yards	4
100 to 500 cubic yards	1 sample for each 25 cubic yards
over 500 cubic yards	may vary depending upon requirements
Containerized Soil	similar to above, may vary due to agency requirements and site specifics

Shoring costs may be incurred during the excavation of contaminated soil. As a part of an eligible excavation, shoring costs may be reimbursable. Shoring costs vary widely depending upon site conditions. The cost of the shoring must have been considered in the Corrective Action Plan, as part of the selection of excavation as the most cost effective remediation method. Shoring costs will be considered on a case by case basis.

An example of excavation costs are shown below. The following assumes an excavation volume of 500 cubic yards.

Consulting Excavation Costs:				
Consulting Costs				
Labor	Task	Units	Rate	Cost
Staff Engineer/Geologist	Field	7	65	455.00
Technician	Field	10	50	500.00
Total Labor				955.00
Equipment Rental/Supplies				
Description	Unit	Units	Rate	Cost
Gas Monitor (PID)	day	1	90	90.00
Truck	miles	60	0.35	21.00
Total Equipment				111.00
Analytical				
EPA Test		Units	Rate	Cost
8015/8020	each	14	55	770.00
Markup		770	0.15	115.50
Total Analytical				885.50
Total Cost/Event				1,951.50

The excavating contractor should bill the claimant directly to avoid unnecessary markup. Actual invoices detailing activities will be required as part of the basic supporting documentation.

Excavating Costs			
Description	Units	Rate	Cost
Excavation	500	5	2,500.00
Backfill	500	2	1,000.00
Compaction	500	3	1,500.00
Total			5,000.00

Waste Transportation and Disposal

The guidelines below are for loading and hauling various contaminated wastes. The costs do not include disposal unless otherwise noted. Contact the Fund staff for pre-approval of these costs before incurring them.

Contaminated Soil:

Loading and hauling costs may be billed based upon cubic yards, tonnage, or hourly breakdown of costs. The end result should be approximately the same. The distance traveled is normally the biggest factor in the cost of transportation. Many disposal facilities will provide/arrange trucking at a cost effective rate for transporting the soil to their facility. This may produce a lower overall cost for transportation **and** disposal. Rates vary depending upon the amount of material being moved.

Contaminated Soil:		
Load	ton	2.00
Load	hourly	see equipment rental rates, Unit Costs, page 9
Transportation	hourly	see equipment rental rates, Unit Costs, page 9
Disposal	ton	see soil remediation section, Project Costs, page 34

Contaminated Liquid:

Loading and hauling costs are normally billed by gallons or hourly. The end result should be approximately the same. Many disposal facilities will provide trucking at a cost effective rate for transporting the liquid to their facility. This may produce a lower overall cost for transportation **and** disposal. Rates vary depending upon the amount of material being moved. If a large amount is to be moved, other methods of disposal may be more cost effective. The Fund reimburses for the most cost effective alternative. Many alternatives exist in performing these types of activities.

Contaminated Liquid:		
Load and Haul	gallon	0.45
Load and Haul	hourly	see equipment rental rates, Unit Costs, page 9
Disposal	gallon	0.40

Containerized Waste:

Containerized wastes, usually stored in 55 gallon drums, are most often generated during drilling activities (for soil) and well sampling (purge water). Depending upon site conditions and contaminant level, disposal options may vary. If the soil contaminant level is negligible, it may be disposed of on-site, or aerated until it may be disposed of on-site. Depending upon the amount of contaminated material, it may be more cost effective to use the disposal methods described above (such as adding them to existing stockpiles). Many alternatives exist in performing these types of activities.

Containerized Waste:		
Load and Haul Soil	gallon	1.25
Load and Haul Water	gallon	1.25
Load and Haul	per hour	see equipment rental rates, Unit Costs, page 9
Disposal, Water	gallon	0.40

Soil Remediation

Some of the more common methods of soil remediation for underground storage tank releases are shown below. The costs listed below are a general overall project cost (design, installation, operation, and destruction) and are shown for informational purposes only. A Corrective Action Plan must be prepared describing the chosen method. The approved plan is used as the basis to solicit multiple bids from consultants and contractors. The Fund will only reimburse the costs of actual work conducted and will require the standard breakdown of all charges submitted for reimbursement.

Soil remediation can be broken down into on-site and off-site options. On-site refers to remediating the soil without removing it from the property where it originates. This should not be confused with in-situ which refers to remediating the soil without excavating. Off-site refers to removing the soil from the site and treating or disposing of it elsewhere at a treatment or disposal facility.

The Fund encourages the use of recycling technologies in remediating contaminated soils. Hydrocarbon contamination can be safely and effectively remediated and the soil reused without significant restrictions or hazards. However, the reimbursement for remediation will be based upon the **most cost effective available option.**

The costs below are for guidance purposes only. The costs will change as regulations, business conditions, competition, availability, and negotiability change. Costs should be negotiated with each specific site, since great variability exists in this industry at this time. **The actual invoices from the facilities must be supplied for reimbursement purposes.** Units should be maintained in tons since cubic yards are subject to uncertain "fluff" factors, and bulk densities of the soils around the state vary significantly.

Contact Fund staff for pre-approval of all soil remediation costs before incurring them.

The costs associated with off-site remediation and disposal are the costs of treatment at the facility only and do not include the excavation, loading, and transportation costs required to move the contaminated soil from the site to the treatment facility (see Soil Excavation, Project Costs, page 30 and Waste Transportation, Project Costs page 32). The costs include all "tipping" fees, weighing fees, manifest fees, etc.

On-Site Remediation:

Soil is treated in-situ (in place, without excavating) or ex-situ (with excavating) without leaving the site. This can often be a very cost effective alternative if enough contaminated material is present to warrant it, if space is available, and if trucking and disposal options are restrictive. In-situ treatment has encountered some difficulties in the past and it is recommended that the Fund be contacted before implementation of an in-situ remediation alternative.

Aeration, Land Farming:	Contamination in the soil is allowed to naturally convert to a vapor state and disperse to the environment or a vapor treatment system. Permits may be required from the local Air Pollution Control District (APCD). May be used to reduce contaminant level to become acceptable to certain disposal facilities. Costs vary depending upon site specific conditions, contact Fund staff for pre-approval.
Bioremediation:	Soil is bioremediated on-site and used as backfill on-site or disposed as clean fill. ex-situ: Many companies have successfully remediated soil where the soil is excavated and the treatment is conducted above ground using bioremediation. Costs vary depending upon site specific conditions, contact Fund staff for pre-approval. in-situ: This is still considered an experimental and unproven technology and must be considered carefully for effectiveness and costs. Costs vary depending upon site specific conditions. Contact Fund staff for pre-approval and eligibility consideration.
Thermal Desorption:	Contaminated soil are thermally desorbed from soil in mobile rotary kiln and the vapors are burned in a flame burner or catalytic oxidizer. Costs vary depending upon site specific conditions, contact Fund staff for pre-approval.
Vapor Extraction:	Contaminants are "vacuumed" from subsurface soils and vapors are treated using thermal oxidation, catalytic oxidation, internal combustion engine, or vapor-phase activated carbon. Costs vary depending upon site specific conditions, contact Fund staff for pre-approval.
Others:	These will be dealt with on a case-by-case basis. Costs vary widely depending upon site specifics, contact Fund staff for pre-approval.

Off-site Remediation:

Soil is excavated and removed from the site. It can go to a facility, such as those described below, or it can be remediated on another site. The claimant can sometimes arrange another site for aeration or bioremediation of the soil.

Asphalt Recycling:	Contaminated soil used as a substitute for sand aggregate in asphalt production.	
	Less than 1,000 ton	$45/ton
	Greater than 1,000 ton	$40/ton
Thermal Desorption:	Contaminated soil are thermally desorbed from soil in a fixed facility rotary kiln and the vapors are burned in a flame burner.	
	Less than 1,000 ton	$45/ton
	Greater than 1,000 ton	$40/ton
Bioremediation:	Soil is bioremediated at a dedicated facility and used as a landfill cover or industrial fill. Costs will vary depending upon the level of contamination found in the soil.	
	Less than 1,000 ton	$35/ton
	Greater than 1,000 ton	$30/ton

Off-site Disposal, Treatment, or Recycling:

The excavated soil is trucked to a dedicated commercial facility and disposed, treated, or recycled. Different areas of the state have different facilities available. Check with your local regulator to find what facilities are available in a given area. Be sure that facilities have current licenses and permits to accept the material being sent to them.

Class I Landfill:	Accepts 'hazardous' wastes, uncommon for UST Fuel tank contamination.	
	non-RCRA Cal. Haz.	$100/ton depending upon amount
Class II Landfill:	Accepts designated wastes.	
	designated	$15 to $60/ton
Class III Landfill:	Municipal facilities can sometimes accept varying levels depending upon their specific design and permits. May use remediated soil as "cover" material at no cost.	
	contaminated soil	$15/ton to $35/ton
	remediated soil	$0/ton to $15/ton
Native American Reservation:	Usually accepts 'non-hazardous' common hydrocarbon contaminated soils. May dispose or bioremediate.	
	Less than 25 ton	$35/ton
	Less than 100 ton	$30/ton
	Less than 1,000 ton	$25/ton

Reimbursement for disposal costs will be made based upon the most **cost effective** method available. If the disposal method chosen is not the most cost effective (disposal and transportation), the claimant will be responsible for the balance.

Cleanup Progress Reports

Most regulatory agencies require detailed corrective action reports about the site and the activities that take place. If more than one assessment report is prepared, this happens often when two separate and distinct cleanup activities take place, much of the detail in the report is duplicated. Certain sections of some reports may be excerpted from other reports with little to no modification (e.g., prior activities, sampling protocol followed for drilling or groundwater sampling, health and safety protocols followed, etc.). The location, geology, hydrogeology, and sampling protocols should not change significantly. The tables and maps need to be updated to include new data, but no major changes should be needed. The appendices of the document may be from other sources (e.g., sample results from the laboratory) or duplicates (e.g., standard sampling protocol followed). Although the amount of effort by various staff may vary slightly for different types of activities, the end cost should be roughly the same.

Remediation Systems:

The local regulatory officials must be kept informed about the continued operation of any remediation system. Usually this will take the form of a standard quarterly report. The level of detail and update for the report will be dependent upon the activities and changes to the system during that period. The analytical and sampling costs are covered in operation and maintenance. The operation and maintenance data, along with the analytical information, are included in the report.

Soil Remediation:

The costs of a remediation report for off-site remediation or disposal, and on-site remediation will vary greatly depending upon the method used. Off-site remediation or disposal is a common and proven technique. Quite often less detail will be required in the reports than with other methods.

Cleanup Progress Report				
Charge	Description	Units	Rate	Cost
Associate Engineer/Geologist	report review, signature	5	80	400.00
Staff Engineer/ Geologist	report prep	10	65	650.00
Drafts Person	map/boring log preparation	4	45	180.00
Clerical	report prep./tables/typing/repro	4	35	140.00
Report Reproduction	RWQCB(1)/EHS(1)/Client(2)	4	15	60.00
Total Cost per Report				1,370.00
Total Cost per Subsequent Report				850.00

Site Closure Study/Reports

Before site closure can be granted for a site, it must be shown to the local regulator's satisfaction that the site does not pose a threat to human health, safety, or the environment. It is important to note that sites can be closed without necessarily having reached the site specific cleanup goals. If it can be determined that a trend in an on-going remediation process (such as natural attenuation or passive bioremediation) exists, that human health, safety, and the environment are not threatened, sites may often be closed at levels higher than those set by non-degredation policies. The amount and type of information that will be required for site closure depend upon:

- the amount of investigation conducted during the site assessment phase
- the type of contamination
- site geology and hydrogeology
- the remediation process used
- the site use

Usually, at a minimum, the site's wells will need monitoring for a year. Additional wells or the installation of borings or CPT probes may be required depending upon the conditions above. Requirements vary greatly from agency to agency and site to site. Most of the physical activities that will take place have been covered in this document previously. The costs of Site Closure reports are similar to costs covered in previous sections of this document.

Site Survey:

A site survey is normally conducted to determine the well head elevations and locations so that groundwater gradient may be determined. A survey is normally required only after new wells have been installed, or significant modification have been made to existing wells. The surveys are often conducted by a subcontractor or the consulting firm's in-house surveyors. The costs below are inclusive of all staff, equipment, data reduction, and mapping costs needed to perform and describe a site survey.

Site Survey:		Cost/event
Site Survey (3 wells)	survey	350.00
Site Survey (10 wells)	survey	600.00

Underground Utility Check:

An underground utility check is normally conducted before drilling or other subsurface excavation activities take place to ensure that the activities do not encounter buried utilities such as water, sewer, electrical, and telephone services. The check may vary from the simple expedient of notifying Underground Services Alert (USA) and marking locations of proposed activity to a full electromagnetic scan of the intended excavation area. The degree of care needed is based upon the potential for damages and likelihood of encountering unknown utilities. The costs vary accordingly. Shown below are two examples.

Underground Utility Check:	Cost/event
USA notification for three drilling points	70.00
Electro-magnetic scan for underground structures	400.00

Traffic Control:

Traffic control may be needed when activities (most often drilling) are conducted in streets, roads, and highways. The need for the traffic control must be justified. It is important to consider the costs of traffic control not just in the placement of wells, but in the sampling as well. The amount of traffic control needed will depend upon the location of the activities, street traffic levels, local regulations, and permit requirements.

Traffic Control:	Cost/day
Basic Traffic Control for closing one lane	350.00
Extensive traffic control requiring multiple flagpersons and closure of lanes	950.00

Utility Costs:

Most remedial systems will be attached to an existing utility service. The Fund will reimburse for the reasonable direct costs of utilities. It is very important to consider the most cost effective method of providing power and service to a

remedial system. For some systems the utility costs can exceed the purchase price of the equipment itself. This **must** be considered (and reconsidered periodically, usually as part of the system efficiency evaluation under Operation and Maintenance) when determining what system is to be used on a site. Utilities should be in the claimant's name and separated from their regular utility service (usually by a separate meter). Utility costs should be paid by the claimant and not marked up by the consultant.

Mobilization:

Normal and reasonable mobilization and de-mobilization charges necessary to provide equipment for remediation are reimbursable. Actual invoices and costs must be supplied as part of the reimbursement request.

Monitoring Well Maintenance:

Costs associated with monitoring well maintenance, such as replacement of rusty locks or pieces of the well which may wear out due to the use of the monitoring well, are eligible for funding. Costs associated with damage to the monitoring well caused by activities other than corrective action are not eligible for funding. Locating lost monitoring wells is not an activity which is usually associated with corrective action and is not normally eligible for funding.

Bonds:

Some agencies and municipalities may require security bonds for work done within their right-of-way. Commonly referred to as "Performance Bonds," these are refundable once the work has been performed, or once the corrective action has been completed and the facilities removed or replaced to the agency's satisfaction. Since these bonds are refundable, the Fund does not reimburse the bonded amount. The costs associated with preparing the bonding application is typically reimbursable.

Policies

Personnel Qualifications & Task Descriptions

Listed below are common titles and qualifications of persons performing common tasks associated with corrective action. The Fund staff may, if necessary, ask for verification of consultant staff, registrations, and experience before reimbursement can be made at certain rates.

Common Definitions of Personnel and Qualifications	Description of Common Tasks
Principal The Principal has a valid professional registration (i.e. PE, CEG, CE), advanced engineering or geologic science degree and at least 10 years experience in conducting corrective actions for UST's. Administrative and/or professional head of the organization. The principal is responsible for the oversight of all staff in his specific regional office. Charges limited number of hours. Principal should almost never bill field work.	• Expert testimony • Legal strategies • Depositions • Review of most complex sites • New technology innovations
Senior Engineer/Geologist/Hydrogeologist The Senior has a valid professional registration with an advanced engineering/geology degree and at least 7-9 years experience in conducting corrective action. Serves as senior technical leader for remediation projects and has developed substantial expertise in the field of design, economic analysis, cost estimating and comparison of remedial strategies. Responsible for approving designs, reports, plans and specifications before submittal to clients or regulatory agencies. Charges limited number of hours.	• Project oversight/management • Aquifer characterization • Review of technical reports • Review of corrective action plans • Prepares bids and proposals
Associate Engineer/Geologist/Hydrogeologist The Associate has an engineering/geology degree, is registered, and at least 3-5 years experience in conducting corrective action. Must be able to conduct assessment and remedial activities, oversee drilling and monitoring well installation, soil borings, sampling, compile data, have knowledge of QA/QC procedures and protocol, perform aquifer testing and prepare permit applications. Oversee field activities. In responsible charge of all activities for the site. Only visits site as needed.	• Project Management • Engineering/remedial equipment design • Aquifer characterization • Review technical reports • Review corrective action plans • Data review and analysis • Report Preparation • Prepare proposals • Site inspection (occasional)
Project Manager Possesses a bachelor of science in engineering, geology, or a directly related field. Serves as manager for entire projects and has at least 3 years experience in corrective action field. Prepares programs and plan specifications for remediation. Responsible for the gathering of field data and data analysis. Analyzes and interprets data, prepares sections of reports. Periodic site inspection.	• Project Management • Data review and analysis • Report preparation and review • Workplan preparation • Field work planning • Site inspection (periodic)

Common Definitions of Personnel and Qualifications	Description of Common Tasks
Staff Engineer/Geologist/Hydrogeologist Possesses an engineering/geology degree and at least 1-3 years experience in conducting corrective action. Must be able to conduct assessment and remedial activities, oversee drilling and monitoring well installation, soil borings, sampling, compile data, have knowledge of QA/QC procedures and protocol, perform aquifer testing under supervision of the Associate.	• Report preparation • Field work preparation/planning • Supervise Site Assessment activity • Site reconnaissance and mapping • Remedial system installation • Permitting and monitoring • Supervision of excavation activities.
Technician Typically requires a high school diploma, associate degree, technical coursework, and specialized trades training. Requires 2-6 years directly related experience. Responsible for on-site installation, maintenance, and repair of machinery and equipment, and sampling. Collect samples and maintain documentation of operating logs and maintains equipment.	• Operation and Maintenance (O&M) of remedial equipment • Well development and sampling • Waste handling • Decontamination • Monitoring • Free product removal
Drafts Person Typically requires a high school diploma and specialized training in technical drawing and use of CAD systems. Prepares site maps and details as needed	• Drafting • CAD work • Cartography
Clerical/Word Processor General office work, typing, and filing. Operates computer for word processing, spreadsheets, statistical typing, correspondence, report generation.	• Typing and filing • Report generation • Spreadsheets and tables • Document reproduction

Where applicable, staff working on a hazardous site must have the appropriate 24/40 hour OSHA HAZWOPER training.

Professional Registration

The Business and Professionals code and regulatory agencies require registered professionals to sign reports and workplans. A licensed professional will be in responsible charge of all site activities as well as directing the design and implementation of any remedial action. Valid professional registrations include: Registered Civil Engineer (RCE, PE), Registered Geologist (RG), Certified Engineering Geologist (CEG), Certified Hydrogeologist (CH), and Registered Petroleum Engineer (RPE, PE).

Some firms use a registered professional who has no direct affiliation with the firm and employs them as a subcontractor to rent their stamp for review and signing of reports. This is commonly known as a "rent-a-stamp." The use of a so-called "rent-a-stamp," is considered unprofessional and may indicate a lack of qualifications within the firm hired to perform remedial action work, as well as a possible violation of the Business and Professionals Code and Geologist and Geophysicist Act. Per the Geologist and Geophysicist Act, firms that advertise geologic services to the public must have a registered geologist as a partner or officer of the firm. The Business and Professionals Code requires that a registered engineer be an "owner, part owner, or officer in charge of engineering practice" of an engineering business. The addresses below can be used to contact these agencies:

Board of Registration for Professional Engineers and Land Surveyors
2535 Capitol Oaks Drive, Suite 300
Sacramento, CA 95833-2926
(916) 263-2222

Board of Geologist and Geophysicists
400 R Street, Suite 4060
Sacramento, CA 85814
(916) 445-2113

Contractors State License Board
9835 Goethe Road
P.O. Box 26000
Sacramento, CA 95826
(800) 321-2752
(916) 255-3900

Registrations from private associations and other states are not recognized by the Fund and most local regulatory officials. **Personnel without valid California registrations may not be in responsible charge of full-scale investigation and remediation activities.** Invalid professional registrations include: Registered Environmental Assessor (REA), Registered Environmental Manager (REM), Registered Environmental Professional (REP), Certified Environmental Investigator (CEI), and Certified Environmental Specialist (CES). For example, an REA designation (Health and Safety Code Chapter 6.98) is intended to **assist** in the systematic, documented, periodic and objective review of operations and practices to insure compliance with environmental regulations. The periodic assistance with compliance regulations does not qualify someone to be in responsible charge of remediation activities. The REA designation does not certify the REA to work outside their specialty. The specialty can be in many different fields, including asbestos, radon, nuclear, communications, and legal specialties.

The Fund will only reimburse for the activities of firms that are properly licensed and maintain necessary registrations for legal operations in the State of California. It is the claimant's responsibility to hire qualified consultants and to follow applicable state laws in hiring professional services. Contact Fund technical staff for assistance in this regard.

Work Approval and Direction

Fund regulations require that any work that is to be reimbursed **MUST** be approved and directed by the **local regulatory officials** (§2811.2). The Fund requires that copies of all written local agency or regulatory agency orders, directives, and approvals be provided as a basic part of reimbursement.

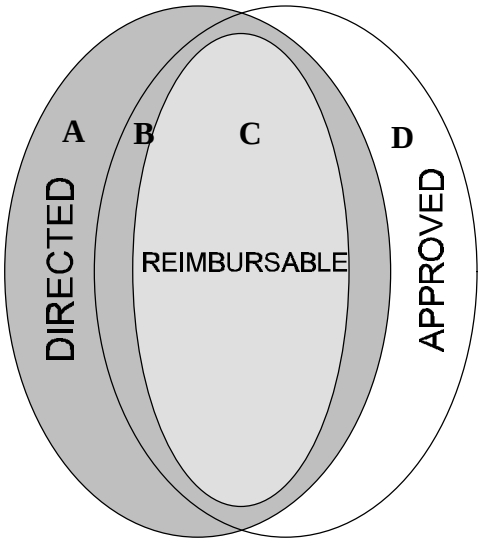
Just because it is directed does not mean it will be reimbursed:

The local regulators are responsible for many tasks, including protecting human health and safety, the environment, and the current and potential beneficial uses of the waters of the State. The Cleanup Fund is only able to pay for reasonable costs directly related to corrective action associated with an eligible petroleum release. This may result in claimants being directed to perform work that is not reimbursable. This does not mean the work does not need to be done. Part of staying in compliance with local regulatory officials includes complying with all their directives and requirements. Compliance is a prerequisite for reimbursement.

If it is to be reimbursed it must be directed and approved:

Work that is not directed or acceptable to the local regulatory official is not reimbursable. The local agency will set the cleanup levels and the objectives for the site. Only those activities which are **required** by the local regulatory agency are reimbursable. Extra levels of effort over and above that required by the local regulators are not eligible for reimbursement. It is the local agency responsibility to approve the workplans and Corrective Action Plans (CAP's) and approve the final results of work conducted. If the work is unacceptable to the local regulatory officials, it will not be reimbursable by the Fund.

The diagram and case examples below may help in understanding how this works.



The following are examples to help explain the diagram. Each claim is evaluated on an individual basis and specific case factors may influence findings. All potential applications of these principles and cases cannot be explored here, these are merely examples.

Case A:

Work is directed but not approved. Example: Local agency directs installation of wells as proposed in the workplan. The wells are placed in another location that does not provide the required information for the regulator and new wells are required. The cost of installing wells in the wrong place is not reimbursable.

Case B:

Work is directed and approved but not reimbursable. Example: A source of contamination other than the eligible Underground Storage Tank (for example: a farm tank, a hydraulic lift tank, a sump, an above ground tank, or a surface spill) is identified and the local regulator requires that it be cleaned up. Spills from ineligible sources are just as much a threat to human health, safety, and the environment, but Fund regulations preclude reimbursement for contamination originating from these types of sources. This can often occur in conjunction with an eligible release from a underground petroleum tank, in these cases some cost apportionment is usually made.

Case C:

Work is directed and approved and reimbursable. Example: An unauthorized release from an eligible Underground Storage Tank is discovered, local regulators are informed and direct investigation. A workplan is prepared, proposing installation of borings and wells, which is approved by the local regulator. The work is completed and an acceptable final report is given to the local regulator. These costs are generally reimbursable.

Case D:

Work is approved but not directed. Example: The local agency requires a cleanup level of 100 ppm TPH. The claimant directs that the site be cleaned up to non-detect in order to sell the property immediately. The local regulator approves of cleaning to a greater level than is required but does not **direct** this additional work. The Fund will only reimburse costs of remediation to the level **directed** by the local regulator.

If you have questions about whether your proposed course of action will be reimbursable or not, be sure to contact the Fund technical staff prior to implementation.

Premiums and Extra Costs

During investigation and remediation activities, certain situations may arise where work may be performed on your site that may cause costs to be charged at a premium rate. Premium charges include overtime, night differentials, double time, and expedited turn-around times. Premium costs are site specific and will be evaluated on a site specific basis. The following provides some guidance about how the Fund would evaluate premiums on costs and extra costs.

Typically, if a person works more than eight (8) hours on a site, the resulting overtime compensation is no more than one and one-half times the normal hourly rate. This, however, does not apply to staff professionals and their managers (exempt employees). If an employee works for less than eight hours on a specific site, no overtime is reimbursable for activities on that site.

In the event that night differentials are warranted and reasonable, the resulting reimbursement rate for labor is no more than twenty percent above their hourly rate. Double time is not allowed except with specific justification where site conditions warrant. These cases will be handled on a case-by-case basis. Contact Fund technical staff for pre-approval of this type of activity to verify that the premium costs are warranted and reimbursable.

Premium costs due to a claimant's desire to not interrupt on-site operations is a business decision. The claimant is free to place restrictions upon when and how the work is performed due to business reasons. The extra costs associated with these restrictions are the responsibility of the claimant, and the Fund will not reimburse for these costs. A reasonable effort to work around current business operations is allowable.

Extra insurance may be required in some instances by permitting agencies. The extra cost for this insurance may be reimbursable if the extra cost is demonstrated to be above and beyond the normal insurance coverage that most firms carry and is required to carry out the corrective action. Any extra insurance or bonding requirements must be shown to be **reasonable** and **necessary.** Contact the Fund for prior approval of these types of costs.

No premiums will be allowed on equipment rates or upon the billing rates of staff professionals.

Rental/Purchase of Remediation Equipment

Equipment Rental Versus Equipment Purchase:

The decision to rent or purchase equipment should be based on the option that gives the lowest overall cost. Section 2812.2(d)(14) of the Fund regulations state that the Fund does not reimburse for costs associated with the "purchase of equipment, unless the claimant can demonstrate that the purchase ... is more cost effective than leasing or renting."

If equipment is needed extensively over a long time it may be more cost effective to purchase the equipment. It is important to consider this because **the Fund will not reimburse rental costs exceeding the purchase price of equipment**.

Claimants should contact Fund technical staff to help evaluate whether the purchase or rental of equipment is the cost effective option.

The decision to rent or purchase equipment is based upon the option that results in the lowest overall cost. Contact the Fund staff for pre-approval of all the costs.

Equipment Purchase:

Depending on the available rental rates for certain pieces of equipment, or if the equipment is needed for a large percentage of its expected useful life, it may be more cost effective to purchase the equipment. Specific emphasis will be placed on soil vapor extraction units, pumps, treatment systems, generators, blowers and support equipment. When dealing with multiple sites, the purchase of equipment may be the most cost effective alternative..

Deciding whether to purchase or rent a piece of equipment is not an exact science: there is an element of judgment involved in making this decision. Claimants are encouraged to contact the Fund's technical staff for help in evaluating whether purchasing or renting equipment is more cost effective.

The decision to rent or purchase equipment should be based on the option that gives the lowest overall cost. All costs, purchase price, rental rate and operation and maintenance costs for the expected duration of the necessary cleanup, must be considered before deciding whether to purchase equipment and selecting a particular piece of equipment.

If it appears that an equipment purchase is appropriate, the claimant must request pre-approval (see Pre-Approval, Policies, page 15) of the equipment purchase.

Equipment Rental:

The Fund will require documentation supporting equipment rental rates. Specific emphasis will be placed on soil vapor extraction systems, pump and treat systems, generators/blowers/pumps, and support equipment.

When deriving rental rates for equipment, the rates must reflect the following factors:

- Capital Cost of Equipment (purchase price)
- Salvage Value of Equipment
- Expected Economic Life of Equipment
- Cost of Capital (interest)

One simple method of calculating a monthly cost of the equipment is the "capital recovery" factor. This allows the cost of the equipment to be carried over a period of time with uniform payments. It includes, purchase price, salvage value, life of the equipment and an interest rate. This is shown by the equation:

$$RR = (P - \frac{S}{(1+i)^n}) \times \frac{i(1+i)^n}{(1+i)^n - 1}$$

Where:

RR	=	Monthly rental rate
P	=	Purchase price of the equipment
S	=	Salvage value of the equipment
n	=	Economic life of the equipment (in months)
i	=	Interest rate (Annual rate divided by 12)

Three examples of how this equation might be utilized are shown below:

Example 1:			Example 2:			Example 3:		
P	=	$60,000	P	=	$60,000	P	=	$30,000
S	=	$0.00	S	=	$6,000	S	=	$ 3,000
n	=	60 (5 years)	n	=	36 (3 years)	n	=	30 (2.5 years)
i	=	0.0083 (10%/12)	i	=	0.0083 (10%/12)	i	=	0.0083 (10%/12)
RR	**=**	**$1,275**	**RR**	**=**	**$1,791**	**RR**	**=**	**$1,050**

For some equipment there can be little certainty regarding the salvage value and economic life of the equipment. Manufacturers are a good source for information regarding the particular piece of equipment being purchased. Obviously, some equipment will last longer than others and equipment life is extended by proper maintenance and shortened by improper maintenance and care. These factors should be evaluated assuming normal maintenance for the equipment. Maintenance costs are billed separately from the rental rate (see section on Operation and Maintenance of Remedial Systems). **All** costs (including: purchase price, rental rate, **and operation and maintenance costs**) must be considered when deciding to choose a particular device or piece of equipment.

Failure to submit support documentation (or inadequate support documentation) for rental rates will result in Fund staff performing a depreciation analysis to determine a reasonable rental rate for the equipment. The claimant should contact Fund technical staff if they have any specific questions regarding this policy.

Appropriate Rental Time Base:
When evaluating rental rates, the Fund will reimburse rental costs based on the appropriate rental time base. If the equipment is needed for one day, or for a short time, then a daily or weekly rental rate should be used instead of a monthly rate. Conversely, if the equipment is needed for several months (e.g., daily monitoring of vapor extraction system influent and effluent for 3 months) then the monthly rental rate should be used instead of the daily rental rate.

Appropriate Level of Equipment Utilization:
The Fund will only reimburse for the actual value associated with the equipment utilization. For example, if an oil water interface probe is used to measure the water level in a monitoring well, then the Fund will only reimburse for the costs associated with the water level meter, which is less than the oil water interface probe. Similarly, if an equipment truck is used to visit the site, when an automobile was sufficient, then the Fund will reimburse based on the rental of the automobile and not the equipment truck.

Subcontractor Markup

Contractors and consultants typically add a markup to their subcontractor invoices to cover overhead and profit. Overhead is the indirect cost associated with items, such as insurance, administration, and carrying costs. The intent of the Fund reimbursing a markup is to allow the primary contractor or consultant who coordinates the project to cover the additional indirect costs which typically range from five percent to ten percent of the subcontracted cost.

The Fund encourages claimants to arrange payment to subcontractors directly to avoid markup charges altogether. This is done by the simple expedient of having the "sub" contractor send their bill directly to the claimant, instead of to the "prime" contractor. This is commonly called "direct billing." Direct billing does not mean the claimant will have to supervise and instruct the sub, the prime still engages with this activity and bills their normal project management charges. The sub sends their bill for payment to the claimant instead of to the prime.

The Fund also encourages the claimant to arrange direct payments to the subcontractors since problems have occurred with non-payment of subcontractors. Specifically, some claimants have received reimbursement from the Fund, those costs were turned over to the prime contractor, who then failed to pay the subcontractors. As a result, the subcontractors filed a mechanic's lien against the property owner for the costs that were not paid by the prime contractor (one of the few recourses the subcontractor has to get paid is to file a mechanic's lien against the property owner). The Fund will only reimburse for costs once, and any difficulty arising from this situation is entirely the responsibility of the claimants. If the claimant contracts directly for costs, the Fund will be able to ensure that all parties receive the amount reimbursed and avoid most problems of this nature.

Direct billing is especially important where large subcontracted costs are expected, such as the case for a large remedial excavation. In these cases, direct billing should be utilized if at all possible for soil treatment, excavation, and transportation costs.

Markup can become excessive when one or more of the following occur(s):

- The percentage of the markup is high.
- The amount of work performed by subcontractors constitutes a majority of the total project cost.
- Markups are applied inappropriately.

The following are the markups the Fund considers reimbursable for specific types of activity and services:

Total Contract Amount	Maximum Allowable
Less than $50,000	15%
Greater than $50,000	10%

The following restrictions apply to markups on subcontractor costs:

- **Markups must not exceed 5 percent (5%) of the total contract cost on excavation and soil/groundwater transportation, treatment or disposal.**
- Primary contractor must perform corrective action work; e.g., primary contractor cannot simply serve as a "broker" and subcontract out all work.
- The primary contractor must be a licensed contractor to be able to charge a markup on construction services (see Technical Review Guidance Document No. 2, The California Contractor's State License Law and the USTCF, dated 10/14/94).
- Markups can only be applied to the actual subcontractor costs paid by the primary corrective action contractor (e.g., not "list" or other artificial price).
- Markups cannot be applied to direct charges by the primary contractor
- Markups cannot be applied to charges from an affiliate or subsidiary company of the primary contractor.
- **A copy of the actual subcontractor invoice (with detail) must be provided with the reimbursement request.**
- Subcontractor costs must be reasonable and necessary for corrective action.

Many claimants wait for reimbursement before paying their consultants. This may result in an increase in costs to the consultant. The Fund is a reimbursement program and does not reimburse for interest or other costs incurred because of lack of prompt payment. Any costs accrued due to waiting for Fund reimbursement are not eligible and do not constitute a reason to charge an additional markup.

Three Bid Requirement

The law that established the Underground Storage Tank Cleanup Fund (Fund) requires that claimants who contract for corrective action work must receive multiple bids (at least three) for future work if they file a claim against the Fund. The effective date of the regulations was December 2, 1991. Any work conducted after that date must be supported by multiple bids (at least three), except for:

- Work already under written contract as of December 2, 1991. This includes continuation of work underway, if covered by a contract. For example, a contract for investigative activity already underway may be extended without going to bid if: (1) work is required by the regulatory agency; and (2) work is consistent with, and specific to, the original scope of work. In no case shall work move from investigation to cleanup without going to bid.
- The first $10,000.00 of eligible corrective action costs (this does not include tank removal, upgrade or replacement).
- Corrective action work conducted by local agency force account on their own site(s).

Effective July 1, 1995, the bid process was modified to include:

- Any claimant who submits a claim to the Fund for the payment of professional and geologic work shall submit multiple proposals and fee estimates supporting the work.
- Any claimant who submits a claim to the Fund for payment for remediation construction contracting work shall submit multiple bids supporting the work.

Claimants must follow applicable state laws and regulations in procuring qualified consultants/ contractor services, and must ensure that such services are obtained from qualified firms at a reasonable price.

Where multiple bids/proposals are required but not obtained by the claimant, final approval may be given by the Fund provided Fund staff finds that, based on information submitted, the three-bid/proposal requirement is unnecessary, unreasonable, or impossible to comply with under the circumstances pertaining to a particular claim.

Where three bids/proposals have been obtained, the Fund will generally reimburse eligible costs limited to the lowest submittal unless the claimant's selection conforms to the costs included within this document. The claimant has the ultimate responsibility in selecting whom they wish to award. For example, if the lowest firm is not qualified to do the work, or if an obvious "low ball" is submitted, or if the claimant finds that the lowest firm has a poor performance record, these would be instances where a claimant would not want to award to the lowest bidder.

When the corrective action work is complete, all work must be acceptable to the appropriate regulatory agency in order to be determined eligible for USTCF reimbursement.

IMPORTANT POINTS TO REMEMBER IN OBTAINING BIDS:

- Although corrective action is defined in four distinct phases (Article 11 in Chapter 16 of the Underground Storage Tank Regulations), the Fund recognizes that for practical purposes there are two distinct efforts; namely, contamination delineation (investigation) and contamination cleanup. In other words, as a minimum, the claimant must receive three bids/proposals on the investigation effort (Phases I and II) and three bids/proposals on the actual cleanup effort (Phases III and IV).
- After the claimant receives an order to conduct cleanup work, a workplan must be submitted to the local regulatory agency. This workplan must be reviewed and approved by the local regulatory agency and should be the basis of the bid/proposal document. It is highly recommended that the bid/proposal document contain unit/cost requirements to ensure comparable responses.
- After the consultant/contractor completes Phases I and II (investigation phases), they are required to submit to the local regulatory agency, a Corrective Action Plan (CAP). The CAP includes among other things, (1) the results of the investigation effort (vertical and horizontal delineation of contamination); (2) recommended cleanup method; and (3) cost estimate of cleanup. This document (the CAP) then becomes the basis for the bids/proposals for the cleanup Phases III and IV.
- The Fund has supplied every claimant with a copy of the Petroleum Underground Storage Tank Cleanup Fund Corrective Action Guide (CAG). This document has been prepared to answer many of the questions regarding bid documents and the bidding process.

CLAIMANT'S DIRECT RESPONSIBILITY:

Soliciting bids/proposals for corrective action work is similar to obtaining estimates to conduct work on your house or automobile. It is recognized, however, that while work on your house or automobile can be defined in definitive terms, the same cannot be said for corrective action work and in particular, the investigation effort since the work cannot be precisely defined. However, the claimant can take the following steps and do their homework in ensuring that they have made their best faith effort in obtaining services from qualified contractor/consultants and at reasonable prices:

1. Meet with the regulatory agency directing the cleanup to gather input regarding scope of work and a list of potential consultants/contractors.
2. After selecting several potential contractors, thoroughly investigate their performance record.
3. Use common sense and don't be afraid to ask questions.
   Contact the Fund technical staff for assistance in reviewing bids or the need for obtaining bids.

We highly recommends that claimants deal with the Fund and its staff directly regarding **all** Fund issues. Fund staff has extensive experience in assisting claimants through the funding process. It is the Fund's experience that use of another party to act as a claimant's manager for Fund issues has caused difficulty in communications, delays in application processing, delays and/or reductions in reimbursement, and increased possibility for fraud without significantly improving the amount reimbursed. The Fund has found that those claimants who manage their own claims have encountered less difficulty getting reimbursement, speedier claims processing, and a higher rate of return from the Fund.

What the Fund expects of a claimant does not require extensive legal or environmental knowledge. The tasks involved in managing a claim can be performed by any claimant who approaches the process in a straight forward business-like fashion. The types of activities a claimant would typically conduct are: working with the local regulatory officials to determine the requirements for their site, working with their consultant to ensure the activities proposed are what the local regulator wants, working with the Fund staff assigned to the claim to ensure the activities are reimbursable, gathering and submitting the documentation that is required for the Fund staff to review.

Fund staff are available to the claimant to help, clarify, and discuss any requirements for their site as they pertain to the Fund. **The best source of information regarding Fund policies and procedures on a particular site is the Fund staff specifically assigned to that site.** After all, it is Fund staff who have been empowered with the authority for creating and implementing the policies and procedures in reimbursement of the costs.

Management costs are not eligible for reimbursement. The use of a third party increases the total cleanup cost to the claimant and, in many cases, has not increased the amount reimbursed to the claimant. In addition, a manager does not have the claimant's intimate knowledge of the site, commitment to getting reimbursement, and the claimant's best interest as their primary concern.

If the claimant is a small business, a business manager or secretary may be available to perform day-to-day management of a claim and obtaining reimbursement. If the small business does not have anyone capable on staff, a CPA, accountant, or other person directly involved in the operation of the small business may be able to help.

Pre-Approval

What pre-approval is:

Pre-approval is a method by which the claimant can come to an understanding with the Fund, prior to starting a corrective action project. If the proposed project activities are completed, as presented for those costs pre-approved, then reimbursement is virtually assured.

What pre-approval is not:

Pre-approval is not a requirement. Pre-approval is **not** pre-payment. Pre-approval is not an exemption from the documenting or three bid requirements.

How pre-approval works:

After the claimant receives directives to begin corrective action from their local agency, they choose a consultant to prepare a workplan. The workplan is submitted to the local regulator for approval. After the local regulator approves the workplan the claimant gets three bids based upon the workplan. The claimant then contacts the Fund engineer for their site and is provided, by Fund staff, with a form which includes a list of the required documents to be submitted for pre-approval.

When the Fund receives and reviews the request and its supporting documentation, the claimant will be informed of the pre-approved amount based on the proposed work that is to be conducted (**if the amount pre-approved is less than the amount requested, it does <u>not</u> mean that the remaining costs will not be reimbursed**). Pre-approval will be limited to those reasonable costs associated with specific corrective action work which the Fund has sufficient supporting documentation.

The claimant monitors the work that is conducted to ensure compliance with the proposal and submits the required detailed invoices (with supporting documents) for reimbursement. If the costs requested for reimbursement exceed the pre-approved amount, justification for the excesses must be provided with the request.

The Fund will review the Reimbursement Request to ensure compliance with proposed corrective action activities and preapproval, and will reimburse those costs determined reasonable and justified.

This process may be modified slightly as warranted. The **<u>claimant</u>** or a representative duly authorized on the Fund's Authorized Representative Designation" form must request pre-approval. Consultants, legal counsel, or parties not duly authorized may not request pre-approval on behalf of the claimant.

Unreimbursable Costs

The following types of costs are **not reimbursable** and as such no acceptable costs have been determined:

1. Any cost **not directly related to corrective action**;
2. Any consequential cost incurred as a result of corrective action such as, but not limited to, loss of rents or business;
3. Any costs associated with removal, repair, retrofit, or installation of an underground storage tank or its associated equipment;
4. Attorney Fees or other legal costs;
5. Interest or any finance charges;
6. Any costs associated with supervision of corrective action by a claimant, unless licensed to perform corrective action work;
7. Costs of soil density tests that are not directly related to corrective action;
8. Detection, confirmation, or reporting of the unauthorized release;
9. Corrective action costs incurred before January 1, 1988;
10. Cost of environmental audits or pre-purchase agreements;
11. Costs associated with testing non-hydrocarbon contamination that is not associated with corrective action;
12. Abandonment of wells not directly impacted by the release and not installed or used for corrective action purposes;
13. Costs associated with blacktop or concrete replacement or repair not directly associated with corrective action;
14. Cost of demolition or repair of buildings, except when demonstrated to the Division's satisfaction that it is necessary as part of the implementation of the most cost effective alternative;
15. The cost of repairs, remodels, or reconstruction of buildings or other improvements;
16. Costs associated with completing and filing of claims and appeals to the Fund;
17. Activity on behalf of the claimant, such as obtaining estimates and services from firms qualified to perform corrective action, being a liaison with the regulatory agencies, hiring and supervising consultants and contractors, reviewing invoices, reviewing reports, preparing invitations to bid, delivering reports, and providing funding, and reviewing or overseeing corrective action work performed by other qualified consultants and contractors;
18. Any cost associated with obtaining the services of contractors or consultants qualified to perform corrective action work;
19. The cost for investigating and cleaning up non-petroleum contaminants;
20. Tests taken under the tank and product lines at the time of removal are often required by the tank removal permits, as such they are considered part of tank removal;

21. The costs of removing tank product lines is part of tank removal costs;
22. Profit to the claimant from the Fund;
23. The costs of removing the contents of an underground storage tank (UST). This is considered to be a part of the tank removal ;
24. Releases that are clearly attributable to spills and overfills occurring as a result of filling or emptying of a tank. Any costs associated with spills and overspills;
25. Contamination from other sources such as: above ground storage tanks , unregulated UST's, spills, clarifiers, sumps, process flow through tanks, vaulted tanks, wastewater treatment tanks, LPG tanks, hydraulic lift tanks , liquid asphalt tanks, tanks containing radioactive substances, emergency containment tanks, drums located in basements, tanks at treatment storage and disposal facilities, unregulated farm tanks, and tanks containing heat transfer fluids;
26. Investigating potential off-site sources of contamination;
27. Ancillary charges such as copies, faxes, telephones, postage, paper clips, binders, tabs, cellular phone charges, computer charges (CADD, word-processing, mapping) and other overhead costs that are typically accounted for in the loaded billable rates charged for consultant personnel

Important Dates and Deadlines

Various regulations have cutoff, requirement and eligibility dates. Some of the important dates for UST owner/operators and the Fund are listed below. The following dates may be used as a reference for Fund regulations and policy uses:

Date	Significance	Source
1/1/84	Tank permit requirements went into effect	H&S §25284
1/1/88	**Oldest incurred corrective action costs that are eligible**	**USTCF[a] §2810**
6/30/88	Date by which corrective action must be initiated if release was prior to 1/1/88	USTCF §2810.1
1/24/89	Financial Responsibility required for petroleum marketing firms (over 1,000 tanks)	USTCF §2806.1[b]
10/26/89	Financial Responsibility required for petroleum marketing firms (from 100-999 tanks)	USTCF §2806.1
12/2/91	**Three bids required for reimbursement of corrective action work**	**USTCF §2812.2**
12/2/91	Corrective Action Plan (CAP) Preparation required for reimbursement of remediation costs	CCR[c] §2725 & USTCF §2811.b
4/26/91	Financial Responsibility required for petroleum marketing firms (from 13-99 tanks)	USTCF §2806.1
12/31/93	Financial Responsibility required for all other UST owner's or operators	USTCF §2806.1
1/1/94	Claims filed after, may request a waiver of the permit requirement	USTCF §2811
2/18/94	Financial Responsibility required for local governmental entities	USTCF §2806.1
12/31/98	Financial Responsibility required for federally recognized Indian tribes	USTCF §2806.1
12/22/98	All UST's must be retrofitted or upgraded to current standards	CCR §2662
1/1/2005	Sunset provision for the Fund takes effect, termination of program unless renewed	H&S §25299[d]

[a] USTCF = California Code of Regulations, Title 23, Division 3, Chapter 18, Petroleum Underground Storage Tank Cleanup Fund Regulations

[b] Per the Federal Act (Subchapter IX [commencing §6991] of Chapter 82 of Title 42 of the U.S. Code)

[c] CCR = California Code of Regulations, Title 23, Division 3, Chapter 16, Underground Storage Tank Regulations

[d] H&S = California Dept. of Toxic Substances Control, Hazardous Waste Control Law, Excerpt from Health and Safety Code, Division 20

In addition to significant dates, there are constraints and deadlines placed upon certain items. The deadlines below should be used in dealing with Fund claims:

Earliest submittal of another reimbursement request (of $10,000 or more) after previous request	30 days
To submit a Reimbursement Request from the date of receipt of an LOC	90 days
Claimants shall repay Fund in the case of any overpayment	20 days
All information must be kept beyond the date of last reimbursement by the Fund **for potential audit**	**3 years**

Appeals

There are several reasons that a claimant may wish to appeal various decisions by the staff of the Fund, the local oversight agency, or the regional water quality control board. It is important for claimants to understand the roles and responsibilities of the various agencies and their different appeal processes if the claimant is unsatisfied with the actions or inactions of various agency staff.

We strongly encourage responsible parties to resolve any issues/problems by working with their case worker or program manager of the appropriate local oversight agency. Local oversight agencies may also have an informal appeal process that can be used to resolve disputes.

Fund Appeal Process

The way the Fund's appeal process works can be summarized in the following steps:

1. Staff Decision: The Fund staff review information presented to them with regard to eligibility and reasonableness of costs. They render a decision based upon the information presented for each cost presented to the Fund for reimbursement. This is termed a "Staff Decision." Usually this only becomes an issue when the Fund staff determines a cost to be **ineligible** for reimbursement.
2. Re-consideration of Staff Decision: If the claimant possesses, or is able to obtain, additional information that would shed new light on the rejected cost, or feels that the staff review was in error, they may request an informal "Re-consideration of Staff Decision." They submit the additional information or clarification along with a letter of explanation and a request for reconsideration. Fund staff will re-consider the issue based upon all information presented. If the result of this re-consideration is unsatisfactory, this process may continue until; the Fund staff declines to re-consider the decision and recommends a Final Division Decision, or the claimant requests a Final Division Decision.
3. Final Division Decision: A Final Division Decision is the first formal level of appeal of a staff decision. These appeals must be in writing and addressed to: Division Chief, Clean Water Programs, P. O. Box 944212, Sacramento, CA 94244-2120
4. Appeal to the State Water Resources Control Board: If the result of the Final Division Decision is unsatisfactory, the claimant may appeal to the State Water Resources Control Board for consideration. At the time that a Final Division Decision is rendered, instructions are given on how to implement this next step.

Other Appeal Processes

The **Local Oversight Program (LOP)** has its own appeal process that is independent of the Fund's. The LOP agencies contract with the State Water Board to provide local oversight of the cleanup at a given site. A recent letter from the UST Program Manager, in part, stated:

> UNDERGROUND STORAGE TANK (UST) LOCAL OVERSIGHT PROGRAM, PETITION PROCEDURES
>
> The purpose of this letter is to make you aware of the appeal or petitions procedures in the Local Oversight Program. Responsible parties have the right to petition any action or inaction by the local oversight agency associated with UST site cleanup, including responsible party identification. A petition to the State Water Resources Control Board must be filed within 30 days from the date of the action/inaction by the local oversight agency.
>
> We, of course, strongly encourage responsible parties to resolve any issues/problems by working with their case worker or program manager of the appropriate local oversight agency. Local oversight agencies may also have an informal appeal process that can be used to resolve disputes...
>
> To obtain petition procedures, please fax your request to Roni Riley at the State Water Resources Control Board at (916) 227-4349...

The **Regional Water Quality Control Board's** appeal process may vary slightly from region to region and it is important to discuss the appeal process with your case worker, there may be an informal appeal process you can follow before you reach this step.

There are two basic ways to appeal an action or inaction to the Regional Water Quality Control Board:

- Request that the item be made a formal topic on the agenda at the Board's next meeting:
  This allows more time for discussion of case particulars and ensures that the item will be addressed.
- Attend a Regional Board meeting and bring the issue up during the 'open hearing' period of the meeting:
  This may allow less time and some meetings do not include an open session, so be sure that this option will be possible and will allow you the opportunity to adequately address the issues.

If the actions of the Regional Board are unsatisfactory, a petition for hearing may be addressed to the State Board. The petition should be addressed to:

Chairman
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

Regulatory Agency Oversight Costs:

Normal and customary oversight costs from the local regulatory agencies to review and approve corrective actions are reimbursable from the Fund. Exceptions to this may include enforcement actions or oversight of non-eligible cleanup. Complete copies of all oversight agency invoices are required before reimbursement can be made.

Claimants Performing Corrective Action:

In cases where the claimant is licensed and/or capable of performing work on their own sites, the Fund will consider reimbursing for their activities as they relate directly to corrective action. Many claimants have performed interim actions such as free product removal at their own sites. Other examples of claimants who have performed their own work are: construction firms, large petroleum companies with in-house professionals, and registered engineers. The Fund cannot pay a profit to the claimant for any work they do on their own site, it can however, pay the direct cost to the claimant of the employee or equipment performing the work. This would include the base salary of the employee, the cost of insurance and benefits package, etc. **For this type of cost to be reimbursed, it should be approved in advance by the Fund staff.** Before using claimant staff, contact the Fund for eligibility considerations and pre-approval.

Travel and per diem:

Travel long distances to and from sites should be minimized. If the costs of travel are to be a regular feature of the job, this should be reflected in the bid pricing (bids must include travel/per diem costs). If possible, firms located in, or with a local office in, the same geographical region should be retained to reduce the amount of travel and expenses associated with site activities. Only actual costs for travel will be reimbursed. This requires submittal of invoices for travel costs. Actual invoice/receipts must be submitted, not credit card receipts. Choosing a consultant outside of a geographical region when competent consultants are available locally will result in the claimant being responsible for any travel and per diem costs. **For travel expenses to be reimbursed they should be approved in advance by the Fund.** Before incurring travel expense costs, contact the Fund staff for eligibility considerations and pre-approval.

New and innovative technologies

The Fund supports innovation and the use of new technologies that have promise in cleaning up sites. In **all** cases it must be demonstrated to be the most cost effective alternative and have a reasonable chance of success. In no case will the Fund reimburse more for an unproven technology than a proven technology. **Any new and innovative methods to be used should be approved in advance by the Fund staff to be considered for reimbursement**. Before using a new or

innovative technology, contact the Fund staff for eligibility considerations and pre-approval.

Costs due to waiting for reimbursement:

Many claimants wait for reimbursement before paying their consultants. This may result in an increase in costs to the consultant. The Fund is a reimbursement program and does not reimburse for interest or other costs incurred because of lack of prompt payment. Any costs accrued due to waiting for Fund reimbursement are not eligible.

Interim Remedial Actions:

Local regulating officials may require interim remedial actions to abate or correct actual or potential effects of an unauthorized release prior to complete delineation. A variety of activities can be undertaken as part of interim remedial actions. The most common remedial action undertaken is free product removal. Interim remedial actions are undertaken when required because there is an immediate and necessary action that must be taken to prevent further danger to human health and safety or damage to the environment or the waters of the state. **Interim remedial actions are not intended to take the place of, or obviate the need for, a feasibility study and corrective action plan.**

Interim remedial action typically consists of free product removal and/or limited excavation of the contaminated source area to prevent significant migration of free product. Some interim remedial action has led to unnecessary and unreasonable costs because it was used to bypass investigation and CAP implementation. Such costs are not reimbursable. For example, excessive interim remedial actions may occur immediately after the underground storage tank removal. Normall interim excavation involves the removal of obviously contaminated soil; however, the Fund has seen overexcavation involve thousands of cubic yards of soil. Without proper sampling, characterization, regulatory directives, workplans, and consideration for cost effectiveness this may result in unreasonable costs. A clear delineation needs to be made between interim remedial action and the full-scale remedial action. The Fund will only reimburse for the amount of the most cost-effective method.

Where feasible, request pre-approval of on-going interim actions to ensure that the costs are reasonable and reimbursable. Obviously, this does not include cases where immediate threats of explosion or other catastrophic hazards to human health, safety, or the environment, exist that can only be ameliorated by immediate action. Any on-going activity, once an immediate threat has been dealt with, should be pre-approved.

Appendix

Example Projects

This section gives examples of two common excavation projects. Many variables may be involved in completing UST corrective action. It is impossible to include every conceivable cost that could occur at every site or predict one cost for completing corrective action at thousands of sites throughout the State.

Each example tries to illustrate the total cost for a common corrective action scenario at a typical site, and shows how the unit costs ultimately add up to the total project cost. It will still be necessary to conduct bidding and use judgment when selecting someone to perform a scope of work at a site similar to one of these examples. The Fund's staff can provide assistance in evaluating and comparing estimates, and pre-approval of costs before costs are incurred is highly recommended. Note, the estimates include all applicable markups. ***NOTE -- These are examples and are provided for illustrative purposes only.***

EXAMPLE 1: Overexcavation After Tank Removal and Disposal of 150 Cubic Yards of Petroleum Contaminated Soil:

The estimate is based on the following assumptions:

- Overexcavation has been directed and approved by the lead regulatory agency.
- Tank removal recently completed: tank pit is open and equipment on-site.
- All excavation will be done on-site: no off-site access is necessary.
- Adequate space and access is available for excavation/stockpiling.
- No shoring or repairs to underground utilities are necessary.
- Soil is disposed at a Class 2 landfill.
- Total Travel Distance -- Site-Disposal Facility-Quarry-Site: approx. 150 miles.
- Total Travel Distance -- Office-Site-Lab-Office: approx. 100 miles.

Task 1 (Overexcavate/Stockpile Soil and Sample Excavation Sidewalls) Includes:

- All coordination of staff and subcontractors,
- arranging for any additional equipment/supplies,
- removal and disposal of approximately 150 square feet of 3 inch asphalt,
- overexcavation of soil and stockpiling of soil on visqueen,
- collecting/storing/transporting soil samples from the excavation to a certified lab,
- laboratory costs for 5 TPH as gasoline/BTEX and 5 TPH as diesel soil samples,
- covering stockpile and surrounding work area with temporary, 6 feet high chain link fence,
- equipment cleanup.

Task 2 (Sample Stockpiled Soil and Arrange Proper Disposal) Includes:

- Travel to and from site to collect soil samples from the stockpile,

- proper handling/logging/transporting of soil samples to a certified lab,
- laboratory costs for 3 TPH as gasoline/BTEX and 3 TPH as diesel soil samples, 1 Reactivity, Corrosivity & Ignitability test, 1 Total Lead test and 1 CAM 17 Metals test,
- evaluating stockpile samples and arranging proper disposal.

Task 3 (Load, Transport and Dispose of Soil) Includes:

- Travel to and from site,
- traffic control,
- loading and transporting soil to Class 2 disposal facility.

Task 4 (Backfill, Compact & Repave) Includes:

- import clean material with sufficient volume to replace volume of soil overexcavated,
- compact imported clean material,
- spread and grade overexcavation area with 4 inches of Class II base rock and repave with 3 inches of hot rolled asphalt,
- cleanup of site and equipment.

Overexcavation After Tank Removal and Disposal of 150 Cubic Yards of Petroleum Contaminated Soil										
		Task	**1**		**2**		**3**		**4**	
Consulting Costs	units	$ /unit	# units	cost	# units	cost	#		#	cost
Project Manager	hr	75	2	150	2	150			1	75
Staff Professional	hr	65	10	650	5	325	10	650	8	520
Laborer	hr	25	6	150					8	200
Equipment										
Photo-Ionization Detector	day	90	1	90						
6 ft Fence with	month	25	1	25						
Visqueen	roll	61.5	2	123						
Truck	miles	0.35	50	17.5	50	17.5	50	17.5	50	17.5
Misc. Supplies	lot	20	2	40	1	20				
Subcontractor										
Backhoe w/ Operator	day	520	1	520					1.5	780
Rubber-Tired Loader w/	day	536					1	536		
Lab: -TPH gas/BTEX,	each	55	5	275	3	165				
-TPH diesel, soil	each	55	5	275	3	165				
-RCI	each	75			1	75				
-Total Lead	each	30			1	30				
-CAM 17	each	175			1	175				
Truck, 18 cubic yard	hr	60					40	2,400		
Class 2 Landfill Fees	ton	25					240	6,000		
Clean Soil	ton	3							230	690
Class 2 Rock	ton	12							5	60
Asphalt Saw w/ Operator	hr	45							4	180
Asphalt Trans. & Disp.	sq.	1.2							150	180
Asphalt Repaving	sq.	2.25							150	337.5
Task Subtotals				***		1,122.5		9,603.5		3,040
Total Cost										16,081.5

EXAMPLE 2: Excavation and Disposal of 1,500 Cubic Yards of Petroleum Contaminated Soil:

This estimate is based on the following assumptions:

- The Corrective Action Plan has been submitted and approved by the lead agency.
- All excavation will be done on-site; no off-site access is necessary.
- Adequate space and access is available for equipment.
- No shoring, demolition or repairs to underground utilities are necessary.
- Soil has been accepted at a Class 3 landfill and will be loaded directly into trucks for transportation and disposal.
- Total Travel Distance -- Site-Disposal Facility-Quarry-Site: approximately 150 miles.
- Total Travel Distance -- Office-Site-Lab-Office: approximately 100 miles.

Task 1 (Planning, Permits and Mobilization) Includes:

- All coordination of staff and subcontractors,
- obtaining all construction and traffic control permits,
- mobilization/demobilization of all equipment.

Task 2 (Excavate, Load, Transport and Dispose of Soil) Includes:

Sawcutting, removing and disposing of 3 inch asphalt over 2,025 sq. ft. area,

- directing and coordinating excavation, loading and manifesting,
- excavation of soil and direct loading into trucks,
- transporting soil and disposal of soil at Class 3 disposal facility,
- surrounding the work area with a temporary, 6 feet high chain link fence for one month and traffic control.

Task 3 (Sample Excavation Sidewalls and Laboratory Analysis) Includes:

- Collecting soil samples from the excavation bottom and sidewalls,
- proper handling/logging of soil samples and transporting soil samples to laboratory,
- laboratory costs for the following tests:
  1. 12 TPH as gasoline/BTEX soil samples,
  2. 12 TPH as diesel soil samples.

Task 4 (Backfill, Compact & Repave) Includes:

- import sufficient volume of clean material to replace volume of excavated soil,
- compact imported clean material,
- spread and grade excavation area with 6 inches of Class II base rock and repave with 3 inches of hot rolled asphalt,
- cleanup of site and equipment.

Task 5 (Prepare Report) Includes:

- Tables and text summarizing the results of the excavation, sampling and disposal,
- conclusions and recommendations regarding the significance of the data collected,
- a site plan showing the locations of all soil samples,
- laboratory data sheets and chain of custody forms for samples collected and,
- QA/QC by an experienced staff member and five (5) copies of the report.

Excavation and Disposal of 1,500 Cubic Yards of Petroleum Contaminated Soil												
		Task	**1**		**2**		**3**		**4**		**5**	
Consulting	units	$/unit	#units	cost	# units	cost	#units	cost	# units	cost	#units	cost
Proj. Manager	hr	75	4	300	4	300			5			
Senior	hr	90									4	360
Staff	hr	65	10	650	28	1,820	8	520	16	1,040	19	1,235
Drafter	hr	45									10	450
Clerical	hr	35									4	140
Laborer	hr	25			28	700			16	400		
Equipment Rental/Supplies												
PID	day	90			3	270						
Fence	month	100	1	100								
Visqueen	roll	61.5			2	123						
Truck	day	0.35			100	35	100	35	100	35		
Misc. Supplies	lot	20					2	40			4	80
Subcontractor												
Excavator	week	680			4	2,720			2	1,360		
Loader	week	536			4	2,144			2	1,072		
8015/8020, soil	each	55					12	660				
8015/8020, soil	each	55					12	660				
Dump Truck	hr	60			420	25,200						
Disposal Fees	ton	22			2,400	52,800						
Clean Soil	ton	3							2,300	6,900		
Class 2 Rock	ton	12							50	600		
Asphalt Saw	hr	45							8	360		
Transp&Disp.	sq. ft.	1			2,025	2,025						
Repaving	sq. ft.	2							2,025	4,050		
Task Subtotals				1,050		88,137		1,915		15,817		2,265
Total Cost												109,184

Abbreviations and Acronyms

The following is a list of common abbreviations and acronyms that are commonly used in the UST environment and industry today. These 'alphabet soups' are continually changing and can become quite confusing. This is for informational purposes only. There is a section on the end of this table where you can add new ones you encounter.

§	section
'	feet (length)
"	inches (length)
APCD	Air Pollution Control District
AQMD	Air Quality Management District
APN	Assessor's Parcel Number
BOD	Biological Oxygen Demand
BTXE/BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CADD	Computer Aided Drafting/Design
CAG	Corrective Action Guidelines
Cal-EPA	California Environmental Protection Agency
Cal-OSHA	California Occupational Safety and Health Administration
CAG	Corrective Action Guidelines
CAP	Corrective Action Plan
CEG	Certified Engineering Geologist
CCR	California Code of Regulations
COD	Chemical Oxygen Demand
CPT	Cone Penetrometer Test
cy	cubic yard (volume)
cfm	cubic feet per minute (air flow)
DEH	Department of Environmental Health
DHS	Department of Health Services
DNAPL	Dense Non-Aqueous Phase Liquid (sinks in water)
DO	Dissolved Oxygen
EHS	Environmental Health Services
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
ft	feet (length)
GAC	Granular Activated Carbon
GC	Gas Chromatograph
gpm	gallons per minute (fluid flow)
HAZWOPER	Hazardous Waste Operations and Emergency Response
hp	horse power
hr	hour
ICU	Internal Combustion Unit
IRA	Interim Remedial Activities
lbs	pounds
LEL	Lower Explosive Limit
LNAPL	Light Non-Aqueous Phase Liquid (floats on water)
LUST	Leaking Underground Storage Tank
MTBE	Methyl Tertiary Butyl Ether

NAPL	Non-Aqueous Phase Liquid
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OVM	Organic Vapor Monitor (see PID, FID)
PE	Professional Engineer
PID	Photo-Ionization Detector
ppb	parts per billion
ppm	parts per million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
REA	Registered Environmental Assessor
RG	Registered Geologist
RP	Responsible Party
RWQCB	Regional Water Quality Control Board
SWRCB	State Water Resources Control Board
SVE	Soil Vapor Extraction
TAT	Turn-Around-Time
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons (EPA method 418.1)
UST	Underground Storage Tank
USTCF	Underground Storage Tank Cleanup Fund
VES	Vapor Extraction System
VOC	Volatile Organic Compound
yard	depending upon usage: unit of length or cubic yard (volume)

Definitions

The following are some of the common terms and definitions that are used in the UST and environmental industries. This is for informational purposes only.

AERATION: For soils, a method of remediating contaminated soil by supplying or exposing the contaminated soil to air. The contaminants volatilize to the atmosphere. For water, the process of bubbling air through water or spraying water into the air to removed dissolved contaminants.

ABSORPTION: The penetration of atoms, ions, or molecules into the bulk mass of a substance.

ADSORPTION: The retention of atoms, ions, or molecules onto the surface of another substance.

AIR POLLUTION CONTROL DISTRICT (APCD): Regulatory Agency charged with maintaining quality of air. Most air discharges from contaminated sites will require clearance of APCD.

AIR SPARGING: Method of removing VOC's (Volatile organic compounds) from ground water. Compressed air is forced through a well screen placed in the aquifer causing a bubbling effect in the groundwater. Contaminants in the groundwater are transferred to the air. These contaminants can then be removed by soil vapor extraction. Air Sparging can enhance bioremediation.

AIR STRIPPERS: Equipment use in the process of mixing groundwater contaminated by petroleum with air. The mixing process removes the dissolved petroleum from the water by transferring it into the air. Local air pollution rules may prohibit or require permits for this method.

ANGLE DRILLING: Instead of drilling vertically, drilling at an angle or a slant. Usually to investigate under buildings or other obstructions.

AQUIFER: An underground geological formation that contains water and is capable of yielding water to a well or spring. A water-bearing formation.

ATTENUATION: The reduction or lessening in amount (e.g., a reduction in the amount of contaminants in a plume as it migrates away from the source).

AUGER: a tool used for drilling into unconsolidated earth materials (soil) consisting of a spiral blade wound around a central stem that is commonly hollow (hollow stem auger).

BACKHOES: A power driven excavating vehicle with a hinged bucket at the end of a long jointed arm, it digs by drawing the bucket toward the power unit.

BACTERIA: Unicellular microorganisms that exist either as free-living organisms or as parasites and have a broad range of biochemical, and often pathogenic properties.

BAILERS: A tube, often constructed of plastic or metal, used for removing water from wells, and for collecting samples of well water.

BENTONITE: A clay with expansive properties used to provide a tight seal around well casings to prevent contaminants from using the well as a pathway for migration.

BID: A detailed and itemized description of proposed costs specific to, and consistent with, a regulatory agency approved workplan and/or directive prepared by a consultant of contractor. See Three Bid Policy.

BILLABLE RATE: Hourly rate charged for consultant. It is often determined by multiplying the employee's payroll times the billing factor, includes, salaries, overhead, and profit.

BIOASSAY: a method used to determine toxicity of specific chemical contaminants. A number of individuals of a sensitive species are placed in water containing specific concentrations of the contaminant for a specified period of time.

BIODEGREDATION: A process by which microbial organisms transorm or alter (through enzymatic or metabolic action) the structure of the chemical contaminant.

BIOREMEDIATION: The process in which microorganisms (bacteria) breakdown petroleum products in the soil. Enhanced bioremediation refers to the addition of microorganisms or chemicals to speed up the natural rate of breakdown of petroleum products in the soil.

BIOVENTING: Combines soil vapor extraction with bioremediation. Uses vapor extraction wells to induce air flow in the subsurface increasing the amount of oxygen available for microbial degradation. Nutrient solutions might also be injected.

BLANK SCHEDULE: Pipe, usually PVC, used in construction of wells that does not have any slots or holes along its length. A number after the name designates specific construction details (e.g., schedule 40).

BLOWERS: Mechanical device used for a wide variety of applications in soil and groundwater remediation. Blowers can provide positive air flow as well as a vacuum force.

BORING (SOIL): A hole in the ground created by a drilling device. Usually as part of assessing the lateral and vertical extent of contamination.

BTEX: Abbreviation for Benzene, Toluene, Ethyl benzene, and Xylene, which are all chemical compounds in gasoline. Site investigations often measure the amount of these compounds in soil and groundwater as such, they are often called indicator chemicals.

CADD COMPUTER: Computer specifically designed to run computer aided drafting and design software.

CALIFORNIA CODE OF REGULATIONS (CCR) Regulations established by the state to regulate many issues within the state including, but not limited to, contaminate levels in the soil and water released from various forms including Underground Storage Tanks.

CALIFORNIA HEALTH AND SAFETY CODE: Codes which were created to ensure an efficient petroleum UST cleanup program which adequately protects public health and safety and the environment.

CARBON ADSORBERS: The use of activated carbon to adsorb phase organic compounds out of an airstream or from a liquid stream.

CATALYTIC OXIDIZERS: An off-gas post-treatment unit for control of contaminant compounds in the air stream. The catalyst allows contaminant removal at a lower temperature due to the catalytic chemical reaction, thus uses less energy, costs less, and can target specific contaminants.

CLAIMANT: A person applying to the Cleanup Fund for reimbursement of corrective action costs from a leaking underground petroleum storage tank

CLEANUP FUND: State of California funding for the cleanup of soil contamination from Underground Storage Tanks. Also known as SB2004, the Fund, and the USTCF. Not to be confused with superfund or other federal programs. Moneys are derived from a fee on each gallon of gas sold in the state.

COMPACTORS: Usually motorized equipment used to compact fill material placed in an excavation.

COMPONENT: An identifiable piece of a larger complex unit.

COMPRESSORS: Usually an air compressor which compresses air for a variety of uses.

CONE PENETROMETER TEST (CPT): A truck mounted rig that pushes coiled tubing into the ground taking measurements or samples as it goes.

CONSULTANT: Any firm which is involved in the assessment of cleanup of an underground tank leak. The consultant is hired by the Responsible Party.

CONTAMINANTS: Any petroleum constituents introduced into soil or groundwater that will adversely affect its quality.

CONTRACTOR: A firm which provides equipment and labor to perform remedial actions.

CORING EQUIPMENT: Equipment needed to remove concrete or asphalt before borings can be installed.

CORRECTIVE ACTION: Activity necessary to investigate and analyze the effects of an unauthorized release; propose a cost-effective plan to adequately protect human health, safety , and the environment and to restore or protect current and potential beneficial uses of water; and implement and evaluate the effectiveness of the activity.

CORRECTIVE ACTION REPORTS: Report prepared for local regulatory agencies documenting steps taken to remediate a site.

COST PROPOSAL: See PROPOSAL.

DATA COLLECTORS: Any of a variety of devices that provide quantitative physical descriptions of the site and activities (thermometer, PID, pressure transducer, etc.)

DATALOGGER: Recording device usually connected to a computer that automatically records data from devices on a site (i.e. pressure transducer).

DECONTAMINATION UNIT (STEAM CLEANER): Device that sprays high pressure water (may be hot or cold) to wash soil and contamination off equipment. Required to prevent cross contamination.

DECONTAMINATION TRAILER: Trailer mounted unit to provide decontamination on site as needed.

DEMOBILIZATION: Move equipment off location.

DEPRECIATION: Loss of value due to usage and passage of time.

DISPERSION: The process by which a substance or chemical spreads and dilutes in flowing groundwater or soil gas.

DISSOLVED OXYGEN METER: Device that measures the amounts of dissolved oxygen in water. Used as an indicator of biological activity.

DOUBLE BILLING: Requesting payment for something that has already been paid or invoiced.

DOWNGRADIENT: In the direction of decreasing static head (potential). The direction water and contaminants will most likely travel without other influences.

DOZERS: Earth moving construction equipment.

DRAWDOWN: Lowering the water table due to withdrawal of groundwater.

DRILLING RIG: Equipment used for drilling borings and monitor wells.

ELECTRO-MAGNETIC SCAN: Device used to detect subsurface metallic objects such as tanks and product lines that operates from the surface.

EFFLUENT: Something that flows out, especially a liquid or gaseous waste stream.

END PLUG: Bottom of well casing or any other type of pipe.

ENVIRONMENTAL HEALTH SERVICES (EHS): Usually a county organization charged with protecting the health of the people, may act as a regulatory agency.

ENZYME: Any of numerous proteins or conjugated proteins produced by living organisms and functioning as biochemical catalysts.

EX-SITU: Moved from its original place; excavated ; removed or recovered from the subsurface.

FATE AND TRANSPORT STUDY: A study of the travel of contamination. Model based method to objectively estimate the effects of natural processes on the stability and distribution of contaminants in the environment.

FEASIBILITY STUDY: Study taken to see if certain steps taken to clean up contamination from particular circumstances will work, how well they will work, and what is the most cost effective option to use.

FILTER SEPARATOR: Device that separates non-dissolved contamination (NAPL) from water.

FLAME-IONIZATION DETECTOR (FID): Equipment used to either detect gross total contamination, or through use of capillary chromotographer columns identify and quantify concentrations of selected volatile compounds.

FREE PRODUCT: The petroleum product that resides in the spaces between the soil particles or floats on top of the groundwater and is generally more accessible for removal or treatment.

FUEL FINGERPRINT ANALYSIS: An attempt to determine identifying characteristics of a particular type of fuel.

FUND: The Underground Storage Tank Cleanup Fund. See CLEANUP FUND.

GENERATOR: Any person whose process produces a hazardous waste in excess of 100 kg/month or acutely hazardous waste in excess of 1 Kg/month, or whose actions first cause a hazardous waste to become subject to regulation. A device that produces electricity for remote sites that are not accessible to standard electrical sources, usually petroleum fuel driven.

GEOLOGIST AND GEOPHYSICIST ACT: California law requiring that any firm advertising geological services must have a registered professional as an officer of the corporation. Section 7838 of the Business and Professional Code.

GEOLOGY: Science of the origin and structure of the earth, especially as evidenced by rocks and rock formations. The structure of the earth in a given region.

GRAB SAMPLES: A soil sample collected without the aid of a coring device. A water sample collected to observe physical characteristics.

GROUNDWATER: The water contained in the pore spaces of saturated geologic media.

GROUT: A watery mixture of cement (and commonly bentonite) without aggregate that is used to seal the annular space around well casings to prevent infiltration of water or to short circuit vapor flow. Also called slurry.

HAND AUGER: Hand held earth boring tool (see AUGER).

HYDROGEOLOGY: Scientific consideration relating to geological formations, soil, surface water, and groundwater.

HYDROCARBON: Chemical compounds composed of carbon and hydrogen.

IN-SITU: In its original place; unmoved; unexcavated ; remaining in the subsurface.

INJECTION WELL: Well used to inject under pressure a fluid (liquid or gas) into the subsurface.

INTERFACE METER: Device that detects the interface depth of non-dissolved contaminants (LNAPL), and the depth of the liquid water interface .

INTERIM REMEDIAL ACTIONS: Actions taken as required to prevent further spread or damage to the environment from the contaminants, usually takes the form of free product removal.

INTERNAL COMBUSTION UNIT (ICU): Similar to an automobile engine (often created using an auto engine) used to combust petroleum vapors.

LAND FARMING: Method of removing petroleum compounds from soils. Contaminated soils are removed from the ground, spread over a given area, and periodically, tilled to speed up the release of VOC's and breakdown of the contaminants. See AERATION.

LANDFILL: Landfills are principally disposal sites for municipal refuse and some industrial wastes. Some landfill may accept petroleum contaminated wastes depending upon their permits.

LITHOLOGY: Gross physical character of a rock or rock types in a stratigraphic section.

LOCAL AGENCY: The department, office, or other agency of county or city designated to have oversight authority for directing the remediation of an unauthorized release.

LOWER EXPLOSIVE LIMIT (LEL): The concentration of a gas below which the concentration of vapors is insufficient to support an explosion. LEL's for most organics are generally 1 to 5 percent by volume.

LUFT MANUAL: A field manual to provide practical guidance to regulatory agencies, consultants, and RP's in investigating and remediating their sites.

MARKUP: The costs the corrective action firms tack on to the subcontractors bills to cover insurance and processing costs.

MOBILIZATION: Move equipment onto location.

NEW AND INNOVATIVE TECHNOLOGIES: Technologies that do not have a definite proven track record and may encounter regulatory and technological difficulties

NON-AQUEOUS PHASE LIQUID (NAPL): Contaminants that remain as the original bulk liquid in the subsurface. See FREE PRODUCT.

O & M SUPPLIES: Operation and maintenance supplies such as oil, filters etc.

ON-SITE LABS: Laboratories capable of running analytical tests on-site as work is being performed.

OPERATOR: Any person in control of, or having responsibility for the daily operation of a UST containing petroleum.

OSHA EQUIPMENT: Equipment required to protect worker health and safety by the occupational safety and health administration.

OWNER: The owner of an underground storage tank containing petroleum. Includes any person who has legal title to a UST and any owner of real property who is a de facto owner of a UST located on such property.

OVERHAULS: To disassemble, repair, or replace parts and reassemble a given piece of equipment after a period of usage.

OVERHEAD: Indirect costs of doing business such as, building rent, telephone connection, power, etc.

PCB's, IGNITABILITY, CORROSIVITY, REACTIVITY, BIOASSAY: An array of analytical tests that may be required to dispose of soil as non-hazardous

PETROLEUM: Crude oil, or any fraction thereof, which is liquid at standard conditions of temperature of pressure, which means at 60 degrees Fahrenheit and 14.7 pounds per square inch absolute pressure.

PHOTO-IONIZATION DETECTOR (PID): Instrument to detect either gross total contamination or through use of capillary chromatography column to identify and quantify concentrations of selected volatile compounds.

PILOT TESTS: Operation of a small-scale version of a larger system to gain information relating to the anticipated performance of the larger system. Pilot test results are typically used to design and optimize the larger system.

PRESSURE WASHER (COLD WATER): Steam cleaner with out steam (decontamination unit).

PROPOSAL: A detailed and itemized description of proposed costs specific to, and consistent with, a regulatory agency approved workplan and/or directive prepared by a consultant of contractor. See Three Bid Policy.

PUMP AND TREAT: A technique that brings contaminated groundwater above the ground through the use of extraction wells. The water is then treated, normally using one of the three process: granulated activated carbon, air stripping, or bioremediation.

PUMPS: A variety of devices used to move water to another location usually from a well.

PVC SCREEN: PVC Pipe with holes or slots along its length that allow fluid to enter.

QUARTERLY MONITORING REPORT: Report of activity at a site, usually to determine effectiveness of remedial activities.

REGULATORY AGENCY: The State Board, a Regional Board, or any local, state, or federal agency which has responsibility or authority for regulating UST's or which has responsibility for cleanup and overseeing the cleanup from unauthorized releases from UST's.

RELEASE: Any spilling, leaking, emitting, discharging, escaping, leaching, or disposing from a UST into or on the waters of the state, the land, or the subsurface soils.

REMEDIAL ACTION PLAN: A plan of activities taken to correct a problem such as fuel contamination of soil or groundwater. Only taken after the completion of a Corrective Action Plan determining what method would be used to remediate the site. Not necessary in many cases.

RESPONSIBLE CHARGE: The independent control and direction, by the use of initiative, skill, and independent judgment, of the investigation or design of professional engineering work or the

direct engineering control of such projects. Section 6703, Chapter 229 of the Business and Professional Codes.

RESPONSIBLE PARTY: Owner or operator of an underground storage tank ultimately responsible for the underground tank release.

RISK ASSESSMENTS: The quantitative evaluation of hazards posed by exposure to toxicants. Risk deduction through management of the contaminant source and/or the exposure conditions can serve as equally viable options to achieve the goal of public health and environmental protection. Thus risk assessment not only frames the regulatory problem, but provides a process for choosing the potential solutions.

RISK-BASED CORRECTIVE ACTION (RBCA): Methodology used to evaluate the potential and existing risks of a contamination to determine if, or how much, remediation is required.

RWQCB: Regional Water Quality Control Boards located in nine locations in California which have the authority for setting cleanup levels, and regulate waste discharges from point and non-point sources. May act as local oversight agencies.

SHORING: Devices used to keep sides of an excavation from caving in.

SITE INVESTIGATION/ASSESSMENT: Procedure conducted at a site to investigate and confirm suspected releases; determine the extent of contamination; and to assess the effects on human health and the environment. This information is used to decide whether cleanup is needed, and, if necessary, the implementation of corrective action.

SKIMMERS/SEPARATORS: Devices used to remove free product from water surface.

SLUG/BAIL TEST: Field test performed to measure aquifer parameters.

SLURRY: Weak concrete mixture used as backfill. See GROUT.

SOIL EXCAVATION: Removing soil from its original resting place.

SOIL GAS SURVEY: Soil gas samples are collected to tests for presence of contamination. Provides indication of lateral extent of contamination

SOIL REMEDIATION: Any of a variety of techniques used to render soil non-contaminated.

SOIL VAPOR EXTRACTION: Draws fresh air into the ground and brings toxic contaminants up to the surface where they can be treated and safely discharged.

SOIL VAPOR TEST/SURVEY: Method used to collect and analyze volatile petroleum hydrocarbons from subsurface soils, vapor samples are collected from a borehole using a hand or vacuum pump and analyzed in the field.

STEP OUT BORINGS: Borings installed further out from sources of contamination to determine extent of contamination.

STOCKPILE CHARACTERIZATION: Analytical sampling of stockpiles to verify need for remediating on if clean.

STODDARD SOLVENTS: A widely used dry-cleaning solvent for spot and stain removal.

STORAGE TANKS: Any of a number of devices used to store material such as water, contaminated products, gasoline, diesel, etc.

SUBCONTRACTOR: If you choose a firm (i.e. consulting firm) to perform the corrective action, it is likely that they will subcontract various aspects of the work such as drilling, sample analysis, excavation activities, etc. to a subcontractor.

SURVEY EQUIPMENT: Equipment used to determine location and elevation of physical objects.

TEST PITS: Pits dug into ground in an attempt to define geological characteristics and contaminated locations

THERMAL DESORPTION: Soil treatment system designed to desorb volatile organic compounds from contaminated soil.

THERMAL OXIDIZERS: High temperature burners used for destroying volatile organic compounds in the vapor phase.

THREE BID REQUIREMENT: Three bids required by the Fund from contractors.

TOTAL PETROLEUM HYDROCARBONS (TPH): A measure of the concentration of mass of petroleum hydrocarbon constituents present in a given sample of air, water, or soil. The level of TPH can be used to determine the amount of contamination at a site.

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (TRPH): An EPA method for measuring total petroleum hydrocarbons in samples of soil and water.

TOXICITY: The property of a substance or mixture of substances to cause any adverse effects.

TRAFFIC CONTROL: People and, or equipment used to control flow of automobile traffic around site activities.

TRENCHING: Trenches dug in ground to install pipes, examine subsurface conditions, or to install other constructs.

TURBIDITY: Cloudiness in water due to suspended and colloidal organic and inorganic material.

UNAUTHORIZED RELEASE: Any reportable unauthorized release of petroleum from a UST, unless authorized by the Board or Regional Board.

UNDERGROUND UTILITY CHECK: A check for the location of buried utilities such as power, gas, and telephone to prevent accidents during site work.

UNDERGROUND STORAGE TANK (UST): A tank and any underground piping connected to the tank that has 10 percent or more of its volume (including pipe volume) beneath the surface of the ground. These tanks are used to store petroleum or certain hazardous chemicals.

UPGRADIENT: In the direction of increasing potentiometric (piezometric) head. The direction water and contaminant would normally flow from without any other influences.

VADOSE ZONE: The zone in between land surface and the water table within which the moisture content is less than saturation (except capillary fringe) and the pressure is less than atmospheric .

VAPOR EXTRACTION TEST: Field test to measure the efficacy of using vapor extraction as a potential remedial option.

WATER LEVEL INDICATOR: Device to measure the elevation of water in a well.

WATER TABLE: The water surface in an unconfined aquifer at which the fluid pressure in the pore spaces is at atmospheric pressure.

WELL COVERS: Cover over wells which provide a water tight security structure and adequate well protection to prevent entry of surface waters, accidental damage, unauthorized access, and vandalism.

WELLHEAD: The area immediately surrounding the top of a well, or the top of a well casing.

WELLS: A monitoring well is different from a water supply well in that it is designed specifically for sampling groundwater. For this reason, domestic, municipal, or agricultural wells can rarely be used for groundwater monitoring, and when they are, supplementary monitoring wells are usually located nearby.

WORKPLANS: Description of work to be performed that is submitted to local agency for approval.

Index

F

G

H

I

L

M

O

P

R

S

T

V

W